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OF  
**PORTO RICO**



**A MONOGRAPH OF SUGAR-CANE VARIETIES**

*by*

**ARTHUR H. ROSENFELD**

*Special Technologist for Cane, Insular Experiment Station of Porto Rico*

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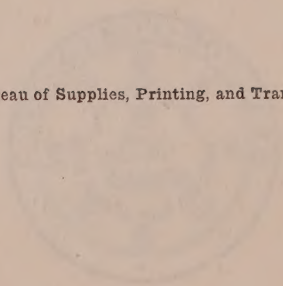
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DEPARTMENT OF AGRICULTURE

# A MONOGRAPH OF SUGAR-CANE VARIETIES

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**ARTHUR H. ROSENFELD,**

*Special Technologist for Cane, Insular Experiment Station of Porto Rico.*

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**Foreword**

and

**“The Varietal Revolution in Porto Rico”**

by

**Hon. Carlos E. Chardón,**

*Commissioner of Agriculture for Porto Rico*

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**With General Observations and Descriptions of 62 Varieties by**

**F. S. EARLE,**

*Former Expert in Cane Diseases at the Insular Experiment Station.*

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**Descriptions of 110 Additional Varieties by the Author and**

**Luis A. Serrano,**

*Assistant Agronomist at the Insular Experiment Station.*

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**50 Varietal Drawings in Color by**

**Mario Brau de Zuzuarregui**

*Director Museum of Porto Rico.*

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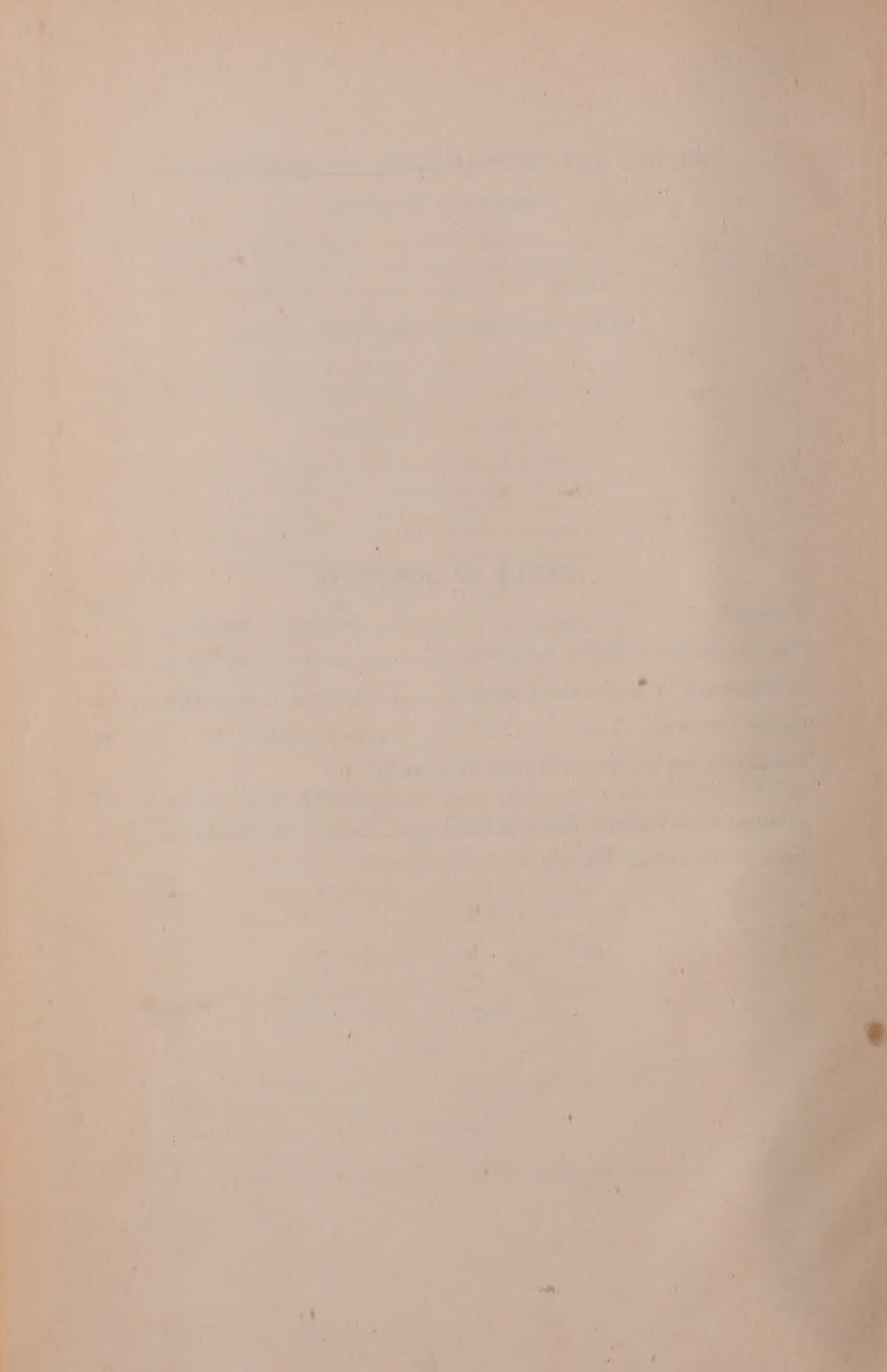
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## TABLE OF CONTENTS

	Page
Foreword-----CARLOS E. CHARDÓN-----	7
The Varietal Revolution in Porto Rico-----CARLOS E. CHARDÓN-----	9
A Monograph of Sugar-Cane Varieties-----ARTHUR H. ROSENFELD---	43
General Remarks-----F. S. EARLE-----	46
Description and Discussions of Cane Varieties in Porto Rico -----ARTHUR H. ROSENFELD---	82
Principal Cane Varieties Tested in Porto Rico---ARTHUR H. ROSENFELD---	84
Index to Sugar-Cane Varieties-----	329



## FOREWORD

The author has suggested that a few introductory remarks be written for his excellent "Monograph of Sugar Cane Varieties". His request is complied with with great pleasure. He needs, however, no introduction to the sugar world: Mr. Rosenfeld's wide experience with cane cultivation in the past decade, can hardly be equalled by any other single man. His field of action has covered a vast territory: Tucumán, Porto Rico, Perú, occasional visits to Cuba, and, finally, Louisiana.

His much-needed book is the outcome of the substantial work started by professor F. S. Earle in 1919. It is indeed, as the author states, a continuation of a work that can justly be considered as a monument in the world's sugar history. As a successor of Prof. Earle, Mr. Rosenfeld has proven to be a worthy follower; in fact, we doubt it any other man could have interpreted better the ideas and plans of the "grand old man".

Their work is now bearing fruit, and our sugar industry is reaping a prodigal harvest. For the benefit of those business interests who would like to realize the full extent of the results achieved, I am publishing a paper entitled "The Varietal Revolution in Porto Rico". It shows results from a large commercial standpoint.

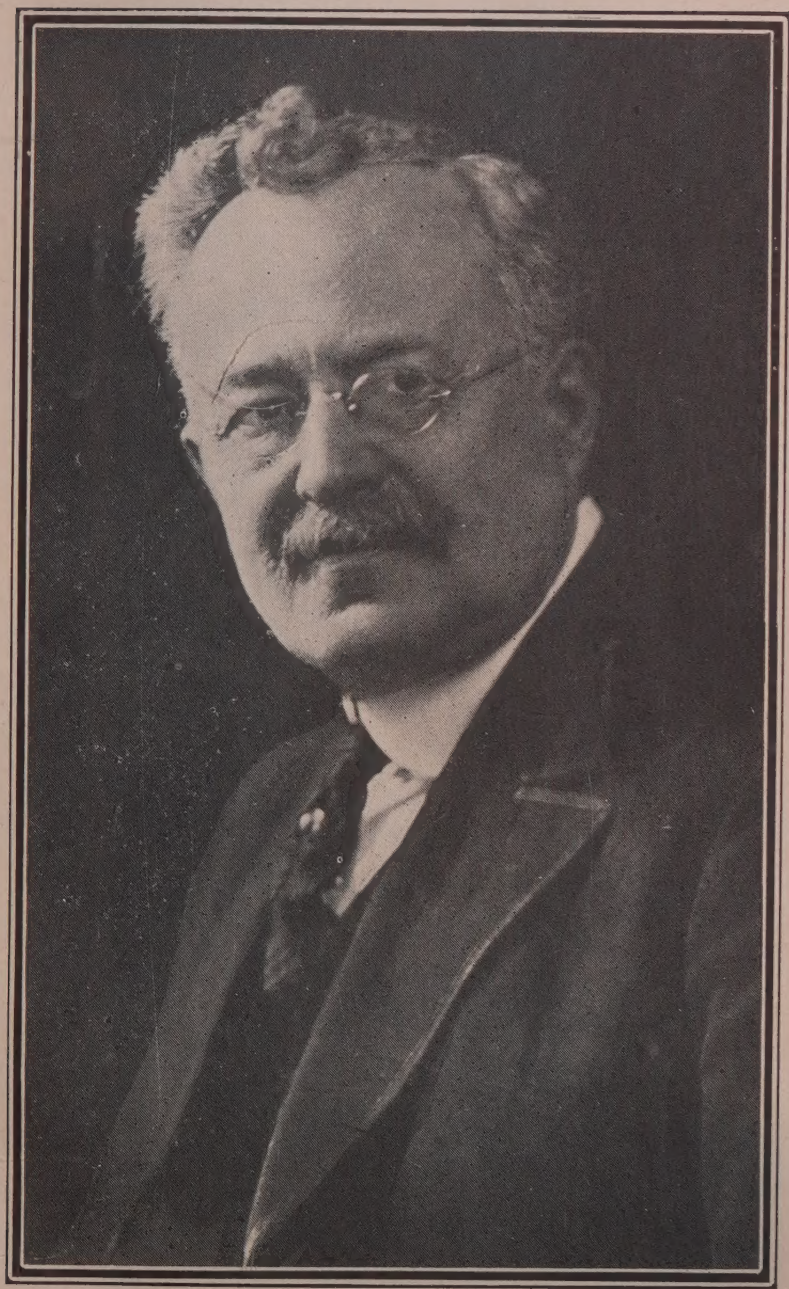
Mr. Rosenfeld's work should be continued. It is a landmark in the history of cane cultivation, an invaluable contribution to the economic welfare of the West Indies, and an inspiration to all his colleagues. Let us all hope that it will stimulate workers in other corners of the globe, so that our knowledge on cane varieties, which so vitally affects sugar production, will be more widely diffused, and better information secured as to their behavior and general cultural characters.

CARLOS E. CHARDÓN.

## DEDICATION

To His Excellency, the Hon. Horace Mann Towner, Governor of Porto Rico, this work is dedicated with the sincere respect due him from the Department of Agriculture and Labor for his unfailing support and keen personal interest in the successful development of this very important feature of the Insular Government's activities.





HON. HORACE MANN TOWNER, Governor



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## THE VARIETAL REVOLUTION IN PORTO RICO \*

By CARLOS E. CHARDÓN,

Commissioner of Agriculture and Labor of Porto Rico

### Porto Rico's Sugar Production.

American and Cuban sugar interests have lately shown a desire to know what has been going on in Porto Rico during the past few years that could explain the large increase in the Island's sugar crops. A small island like beautiful Borinquen with all her available sugar lands taken up since many years ago, contrary to all expectations, has achieved a spectacular rise in her crops of 1925 and 1926, and will surely continue to increase her sugar crops in her successful fight of lowering the cost of production of her sugar by increasing the production per unit of surface.

The following is the Island's sugar production for the last twelve years (tons of 2,000 pounds):

1915.....	346,490	1921.....	489,817
1916.....	483,589	1922.....	408,335
1917.....	505,081	1923.....	379,171
1918.....	453,793	1924.....	447,597
1919.....	406,002	1925.....	660,411
1920.....	485,070	1926.....	603,240

1927 (Department of Agriculture and Labor estimate)..... 612,000

1927 (Sugar Producers' Association estimate)..... 621,000

These figures show that the average for the last two crops and the estimate for the present is 625,217 tons, while the average production of the preceding 10-year period is 440,293 tons, which means an increase of 42.1 per cent.

American and Cuban interests are justified in their inquisitive look for the real cause of this remarkable increase, not for fear of its effect in the world's sugar production, since our entire output is too small to materially affect the price situation, but for the objective lesson that the larger Antille could learn from her smallest but more industrious sister, Porto Rico.

\* Paper presented at the International meeting of the Association of Sugar Technologists held in Havana, March 1927.



What has been going on here then? The present article endeavors to answer the dilemma in a clear light.

#### Factors Affecting our Sugar Production.

The principal factors that need to be considered in our sugar production are four as follows:

1. Acreage.
2. Rainfall precipitation.
3. Mosaic.
4. Varietal selection.

As already stated, all our available sugar lands have been taken up and cultivated since many years back, so it must be expected that acreage fluctuations will be slight. This appears to be the case. The figures in the Insular Treasury Department follow:

1915	211, 110 acres
1916	203, 491 acres
1917	205, 106 acres
1918	256, 431 acres
1919	238, 901 acres
1920	240, 151 acres
1921	241, 372 acres
1922	244, 180 acres
1923	239, 676 acres
1924	236, 600 acres
1925	240, 010 acres
1926	242, 745 acres

The large increase for 1918 is not all due to increased planting, but to a general revision of the property ordered by the Governor, which revealed many small farms which had gone into cane since the War.

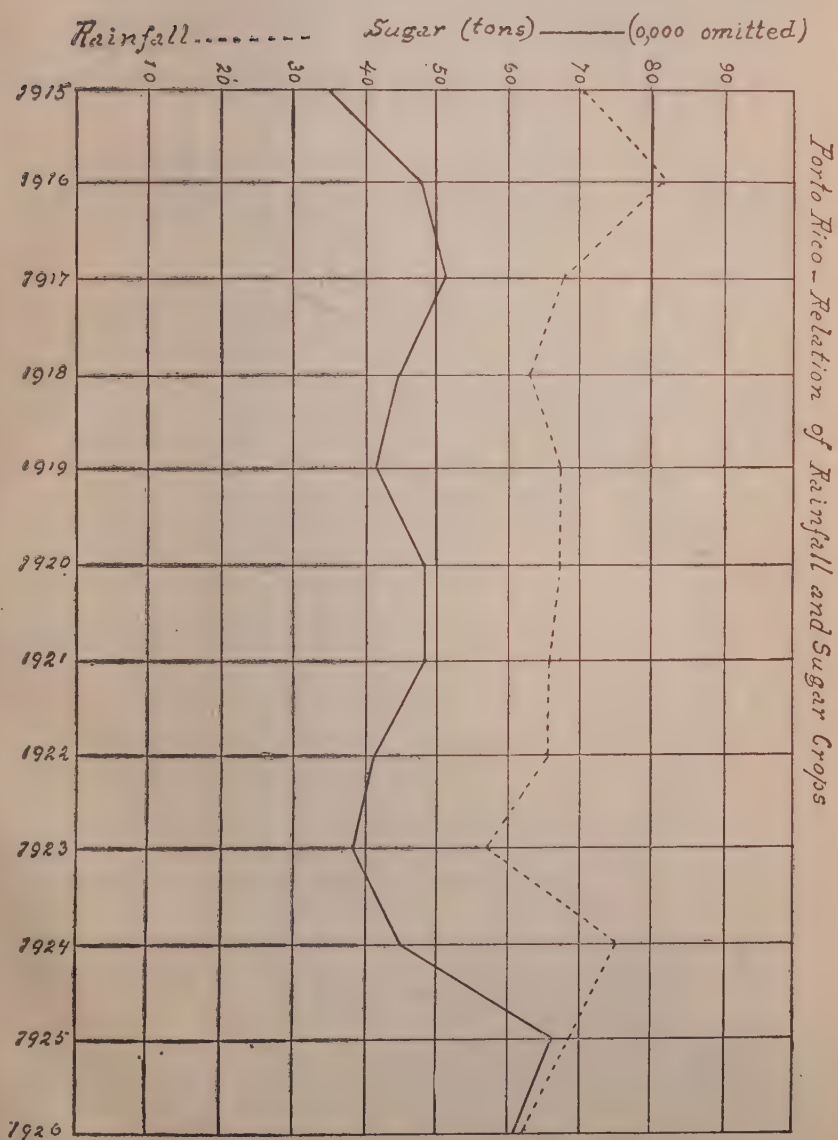
Thus the acreage fluctuations, which have been indeed slight, can not be accounted for materially affecting our sugar crops.

The rainfall precipitation appears to be a very strong factor in production. This is especially so for our dry south coast, where the largest mills are located. Appendix I will show the precipitation in the Island by sections (north, east, south and west) since 1915.

It is easy to correlate our sugar crops to the rainfall precipitation. In fact, Plate A will show graphically, that a distinct correlation existed for the years 1915 to 1925 inclusive. In the present crop of 1927 an unusual thing has happened: despite a decreased rainfall for the preceding year, the crop will be appreciably larger than last year's thus proving that another factor besides rainfall is influencing our production—namely, the new cane varieties.



## Plate A



The writer became interested in watching the growth of the Island's sugar production, since 1925, when the crop suddenly rose, from 447,570 tons in 1924 to 660,003 tons during that year, showing an increase of 47.4 per cent. The causes for such increase received careful study from the writer and they were briefly explained in his report to the Governor of Porto Rico<sup>1</sup> as follows:

"Several factors have contributed to the increase of our crop. In November 1924, a questionnaire was sent around inquiring as to the causes for this increase. Answers were very promptly received from all the mill managers, which have enabled the Department to draw very interesting conclusions.

"All of them reported that the increase in the crop was due largely to very favorable weather conditions. This has been true all over the Island.

"Seventeen mill managers stated that the propagation of high-sucrose-yielding varieties also contributed to the increase of their crops. Most of them mentioned the well-known and famous B.H. 10(12) and S.C. 12(4), as yielding the highest records in sugar. These two varieties are by far the most popular among our growers and they have been planted extensively.

"Thirteen mill managers report that the increased production has been due to the propagation of the immune Uba and other varieties highly resistant to the mosaic. These sections are mostly in the western section or in the Arecibo valley, where the ravages of mosaic were most severe."

The influence of the varietal factor has kept increasing from 1925 on and in 1926 the crop was 603,240 (with 68.37 inches of rainfall the preceding year). Normally, that same precipitation and an equal acreage produced 485,070 tons in 1920 and 489,817 tons in 1921. Still further, for the present crop of 1927 (with only 62.67 inches of rainfall the preceding year) estimated production has been figured at 612,000 to 620,000 tons.

These figures consistently prove the importance of the varietal factor—in fact, what this factor has already occasioned to the Island's sugar production, and what it may bring in the future, fully justifies the title of this paper, "The Varietal Revolution in Porto Rico." Agriculture as a rule is a science of slow evolutionary progress, but in our case, the changes and material benefits derived from it have been so sudden that only the word "revolution" with all its dynamic meaning can fully convey the real nature of the blessings which beautiful Borinquen has received in recent years.

#### **The Mosaic Disease: A Threatening Cloud.**

In 1915, an unknown and mysterious disease appeared in Arecibo extending well into the hilly section to the west of the town. Its effects on the cane were very evidently causing a stunting of the growth, while the symptoms in the leaves were a yellow mottling

<sup>1</sup> Chardón, C. E. The Present High Crop. In Annual Report of the Comm. of Agr. and Labor for 1924-25: Pages 7-10. 1926.

chlorotic appearance of the same. It was known for some time as Yellow-Stripe disease, while in Spanish it was popularized as *matizado*. The disease attracted world-wide attention following the publication of Stevenson's paper is "Phytopathology".<sup>2</sup>

The mysterious disease spread rapidly and in 1918 had invaded practically three-fourths of the entire sugar area of the Island. The actual losses, not very evident during the crops of 1916 and 1917 on account of the abnormally good precipitation, were disheartening for the crop of 1918. Stevenson<sup>3</sup> estimated the loss at \$2,500,000 for 1918, while those of 1917 he placed at \$500,000. In fact, the whole northeastern and western sections of the Island were on the verge of a complete breakdown.

In August 1918, Professor F. S. Earle was commissioned by the United States Department of Agriculture to come down and investigate the disease with instructions to cooperate with the Federal and Insular Experiment Stations. Professor Earle's visit to the Island marks a most important event in the history of our sugar industry. His far-reaching insight of the situation as well as the practical application of control measures which shortly followed, pointed the way out to the final solution of the dilemma. Shortly after Earle's arrival an important headway towards the comprehension of the disease was made: The mysterious "yellow stripe" was found to be identical with the mosaic of Hawaii and the "Gelestropeniziekte" of Java.

The importance of the testing of varieties for resistance to mosaic was early realized by Earle and an extensive experiment was tried at Santa Rita in cooperation with Russell & Co.; 171 different varieties were tested in the field. This experiment whose results were published by the Insular Experiment Station,<sup>4</sup> conclusively proved the immunity of the Uba cane to mosaic. Other varieties proved to be quite resistant, among which were P.O.J.-36 and P.O.J.-234. The rest were either as susceptible as Cristalina and Rayada or more so.

Earle's statement in connection with the Uba, or Kavangire, was as follows:

"This cane was first observed last August in the variety plots at the Federal Station at Mayagüez where it alone was perfectly healthy out of a list of 44 kinds. These plots however had not been planted with special reference to the

<sup>2</sup> Stevenson, J. A. An Epiphythotic of Sugar Diseases in Porto Rico. *Phytopath.* Vol. 7: 418-425. 1917.

<sup>3</sup> Stevenson, J. A. The Mottling, or Yellow Stripe Disease of Sugar Cane. *Journ. Dept. Agr. P. R.* Vol. 4, No. 1: 7. 1919.

<sup>4</sup> Earle, F. S. The Resistance of Cane Varieties to the Yellow Stripe or Mosaic Disease. *Insular Experiment Station Bul. No. 19.* 1919.

disease and the doubt arose whether or not this apparent immunity might be accidental. It was the necessity for deciding this point that first suggested the planting of the Santa Rita experiment the results of which are given in this paper. This original plot was harvested last January yielding at the rate of over seventy tons per acre—far more than any of the other kinds in these plots. It ratooned heavily and has again remained entirely healthy. This with the very severe test at Santa Rita, where ninety other kinds planted at the same time became almost completely diseased within two months after germination, seems to settle the question and we must consider the Kavangire as absolutely immune to the yellow stripe or mosaic disease," (p. 13).

He concludes his paper with the following statement:

"This preliminary experiment shows clearly our great need for a much more comprehensive knowledge of cane varieties. It is to be hoped that the work may be continued until we know not only the comparative resistance and susceptibility of all the different kinds to the mosaic disease, but what is equally important, to the root disease and to the cultural requirements of all our numerous soil conditions."

Thus the Santa Rita immunity experiment brought out the varietal problem as of supreme importance to the Island's sugar industry. A preliminary paper by Earle<sup>5</sup> had already appeared that same year (1919) opening for discussion the whole subject of sugar-cane varieties. It may be interesting to know so as to serve as a basis for comparison the general status of cane varieties in the Spring of 1919, as pictured in said publication, and from other sources obtained by the writer:

*Rayada*—(Striped Cheribón) was holding first place, prevailing in all the northern and western districts and also commonly found in the south and east.

*Cristalina*—was second in acreage, being most abundant on the southern coast and in the Fajardo district.

*Cavangerie*—a markedly hardy cane for poor, worn-out soils, followed in acreage, especially in the Isabela district and in the hilly lands of the north coast, but in mosaic-infected regions it was rapidly breaking down with the disease.

*Yellow Caledonia*—held fourth place. It was quite popular in the Fajardo and Naguabo districts, and was being rapidly extended in the Arecibo and Plata valleys on the north coast, and in the low swampy lands of the San Germán valley.

*Otaheite* or *Blanca*—held fifth place in acreage, being the favorite cane in the Yauco valley and various other districts of the south coast.

<sup>5</sup> Earle, F. S. Varieties of Sugar Cane in Porto Rico. Journ. Dept. Agr. Vol. 8, No. 2. 1919.



Imported seedling cane were quite unpopular at that time except in a few well-managed and progressive centrals. "Mercedita" was going strongly for B-208, while "Guánica" had a few hundred acres planted to D-117 and B-3412. "Fajardo" was trying various seedling canes, D-109, and Sealy Seedling holding very well in the hilly lands, while D-433 was just commencing to show up as a superior cane.

To sum up the situation in 1919, by far the greatest bulk of the acreage, over 98 per cent conservatively speaking, was planted to varieties all of which excepting *Yellow Caledonia* had been under cultivation in the Island for many generations. Seedlings were unpopular but an advance stand had been taken by a few progressive centrals.

With this general situation prevailing, a conscientious study of sugar-cane varieties was imperative and that was the task imposed upon Earle. A large collection of seedling varieties was being grown by the Insular Experiment Station so that there was ample material to study; furthermore, the various centrals which has propagated a few of them were very willing to cooperate in the work.

The "Sugar-Cane Varieties of Porto Rico—II" appeared in 1921, in the July number of the Insular Station Journal.<sup>6</sup> It was a voluminous and careful work discussing all the popular varieties and most promising seedling canes. In the discussion of the Uba cane, Earle says (p. 65):

"It seems certain that the serious outbreak of mosaic disease on the west coast can be easily and quickly dominated by the use of this variety."

The popularity which the Uba attained in the next few years is worthy of a special comment.

#### **The Uba: An Emergency Cane.**

This variety originated in northern India, from where it was carried to Mauritius and Natal in South Africa, where it came to be known as *Uba*. During the heavy gumming-disease epidemic in Brazil, late in the 60's it was taken to that country and from there to Argentina, where it never received any note, owing to their short growing season. It was imported to Porto Rico from the Tucumán Station through the office of the Bureau of Plant Industry in 1913, and the first shipment was planted at the Mayagüez Station where it attracted Prof. Earle's attention for its apparent immunity. Another shipment followed next year, which was equally distributed between the Mayagüez and the Río Piedras Stations.

<sup>6</sup> Earle, F. S. Sugar-Cane Varieties of Porto Rico—II. Journ. Dept. Agr. P. R. Vol. 5, No. 8. 1921.

After the severe immunity test at Santa Rita, the Uba came into prominence as a possible remedy for mosaic in the whole western coast, but it was looked upon with reluctance by the planters owing to its thinness. In the meantime the mosaic was causing a complete breakdown of the whole western coast of the Island. See Appendix II, sections under Pagán District and San Germán Valley, and Appendix III, showing records of Central "Eureka". The tonnage per acre in the San Germán valley was reduced from 15.46 in 1920 to 10.08 in 1922; while that at "Eureka" dropped suddenly from 14.50 in 1920 to 8.00 in 1921, and continued at 8.30 in 1922. Conditions in the Pagán District and in the entire valley where "Coloso" is emplaced were quite similar. The year 1921 was the critical period for the whole western section of Porto Rico, the sudden fall in the prices and the complete breakdown of the field occasioned by mosaic was threatening disaster, when Earle's statement, "It seems certain that the serious outbreak of mosaic disease on the west coast can be easily and quickly dominated by the use of this (Uba) variety", was announced in the JOURNAL. Plate II shows the mosaic infection at its highest in 1921. The situation of our western planters fell short, if the writer may be allowed to establish a comparison, of the desperate situation of the French in Verdun, but here, the unassuming Uba instead of immortal Petain was repeating the glorious phrase: "*Ne passeront pas.*"

The only alternative, then, was *Uba nor nothing*. The results showed that Uba saved the day. In two years, practically the whole western coast was replaced by Uba, and the results by far exceeded all expectations. A few authentic figures will indicate how successful was the victory.

Year	Situation	Pagán District	San Germán	Eureka
1917 . . . . .	No mosaic. . . . .	16.24 tons.	15.78 tons.	.....
1920 . . . . .	Heavy mosaic. . . . .	12.52 tons.	15.46 tons.	14.50 tons.
1921 . . . . .	Heavy mosaic. . . . .	12.40 tons.	13.24 tons.	8.00 tons.
	Uba started in Pagán. . .			
1922 . . . . .	Heavy mosaic in others. .	15.30 tons.	10.08 tons.	8.30 tons.
	Uba in all of Pagán. . . .			
1923 . . . . .	Started in other two. . . .	24.68 tons.	16.41 tons.	14.16 tons.
1924 . . . . .	Uba supreme . . . . .	29.84 tons.	24.51 tons.	20.22 tons.
1925 . . . . .	Uba supreme . . . . .	26.49 tons.	29.49 tons.	19.85 tons.
1926 . . . . .	Uba supreme. . . . .	26.72 tons.	23.72 tons.	21.00 tons.

It may be seen from the above table that the tonnage was doubled and even trebled by the use of Uba. It was a case of emergency, and planters did not stop to think of the troubles that were coming to them from the factory, as a result of the low juices of Uba, together





PORTO RICO—MOAIC INFECTION AT ITS HIGHEST IN 1921  
(Zones of heavy infection, black; medium infection, dotted)

- | SUGAR CENTRALS (in numbers) |                 |                      |                          |
|-----------------------------|-----------------|----------------------|--------------------------|
| 1. Guánica                  | 12. Mercedita   | 23. Carmen           | 34. Eureka               |
| 2. San Francisco            | 13. Ejemplo     | 24. Monserrate       | 35. Juliana              |
| 3. Rufina                   | 14. Pasto Viejo | 25. Plazuela         | 36. Cayey (closed)       |
| 4. Constaneica              | 15. Triunfo     | 26. Cambalache       | 37. Defensa              |
| 5. Mercedita                | 16. Fajardo     | 27. Los Caños        | 38. Santa Juana          |
| 6. Boca Chica               | 17. Canóvanas   | 28. Bayaney (closed) | 39. Juncos               |
| 7. Cortada                  | 18. Victoria    | 29. Alianza (closed) | 40. Pellajas             |
| 8. Aguirre                  | 19. Vannina     | 30. Soller           | 41. Playa Grande         |
| 9. Machete                  | 20. Juanita     | 31. Plata            | 42. Puerto Real          |
| 10. Lafayette               | 21. Constancia  | 32. Coloso           | 43. Córscica (closed)    |
| 11. Columbia                | 22. San Vicente | 33. Rochelaise       | 44. Providencia (closed) |
|                             |                 |                      | 45. Santa Bárbara        |





with other undesirable milling qualities of that cane. The Insular Experiment Station undertook the task of comparing all the factory yields of the mills that were grinding Uba and the results were published by López Domínguez<sup>7</sup> in bulletin form. Controversies between *colonos* and the mills continued until a sucrose scale was finally worked out by the interested mills.

Together with the rise of the Uba, as an immune variety, several P.O.J. canes came also into prominence in the mosaic-infected sections. One of them was a so-called "Egyptian cane", and which turned out to be P.O.J.-105, and also P.O.J.-213, and P.O.J.-234. All these canes had also been imported from the Tucumán Station but were completely infected with mosaic. Their tolerance to the disease, however, was very marked and they rapidly spread over the western coast and the Arecibo valley. They soon became intolerably mixed up, especially the P.O.J.-36 and P.O.J.-213, but Dr. Rosenfeld, who had recently arrived at the Insular Station as Cane Technologist, with his valuable experience in Tucumán, worked out their correct distinctions and published a very interesting work "The Java P.O.J. Canes in Tucumán and Puerto Rico",<sup>8</sup> which finally led to our losing such a valuable acquisition by inducing the Louisiana Sugar interest to offer Rosenfeld an enviable chance of working out for them something similar to what he helped to do both in Tucumán and Porto Rico.

Coming back to the Uba, a serious attempt is now being made to replace it with a variety that would yield more sugar. The Java canes are richer in sugar than the Uba, but there is a growing tendency among the Uba and even the P.O.J. planters to come back to the thick canes. This is especially so in the last year and in the present, when the fame of thick canes, like BH-10(12) and SC-12(4), have continuously tempted them to go back to thick canes. But these varieties are quite susceptible to mosaic. P.O.J.-2725, a nice, thick cane, practically immune to mosaic, attracted a great deal of attention last year, but its sugar content is not very high; and it arrows freely; this has been a disappointment to planters.

Just what will happen to the old western coast of Porto Rico is not known, but the writer is inclined to think that the temptation to plant BH-10(12) and SC-12(4) will be so increased, that they will eventually adopt them for general field practice in the lowlands, while the Javas will continue to be planted in the hills. Central "Cambalache", in the Arecibo valley and situated in a very heavily

<sup>7</sup> López Domínguez, F. A. The Sugar Yield of the Uba Cane in Porto Rico. Insular Exp. Sta. Bul. No. 28. 1924.

<sup>8</sup> Rosenfeld, A. H. The Java P.O.J. Canes in Tucumán and Porto Rico. Journ. Dept. Agr. Vol. 8, No. 8. 1924.

infected mosaic district, long ago fell to the temptation of planting BH-10(12) and SC-12(4), as announced by the writer two years ago.<sup>9</sup> Although the yields have been very satisfactory the mosaic has become so general as to constitute again a serious problem for the future.

#### Losses Occasioned by Mosaic.

In 1921, Figueroa<sup>10</sup> made an attempt to estimate the amount of losses occasioned by the mosaic disease. He divided the Island in regions of: (a) no mosaic, (b) slight mosaic infection, (c) medium mosaic infection, and (d) heavy mosaic infection. He could trace a distinct fall in production in regions of heavy and medium mosaic infection. The exact amount of losses he did not determine but he clearly stated that they run well into the millions.

The writer has continued Figueroa's work up to 1926. (See Appendix IV.) Let us explain briefly the situation by drawing an example: The combined crops of 1916 and 1917—which were the highest up to that time—are taken to represent a production of 100 per cent.

The crops of 1918 and 1919 show marked reductions which had been due both to decreased rainfall and mosaic. There is no doubt that the mosaic was as powerful a factor as rainfall in reducing the crops from 503,081 tons in 1917 to 453,081 tons in 1918 and to 406,002 tons in 1919. The following figures will prove it:

Zones	Infection	1916 & 1917	1918	1919
Second Zone .....	Heavy mosaic .....	51,057 tons 100 %	38,929 tons 76.2 %	30,592 tons 59.9 %
Third Zone .....	Heavy mosaic .....	29,456 tons 100 %	21,896 tons 74.3 %	19,633 tons 66.6 %
Fourth Zone .....	Medium mosaic ....	88,608 tons 100 %	86,367 tons 97.4 %	70,624 tons 79.7 %
Fifth Zone .....	No mosaic .....	97,256 tons 100 %	102,446 tons 105.3 %	92,357 tons 94.9 %
Seventh Zone ....	No mosaic .....	72,623 tons 100 %	75,645 tons 104.1 %	66,917 tons 92.1 %

These figures show that in 1918, zones fifth and seventh showed slightly increased production, but the decreased production of heavily infected areas brought about a general decrease. In 1919, the drought enters in as an important factor, causing zones fifth and seventh to

<sup>9</sup> Chardón, C. E. Mosaic Investigation at Central Cambalache. In *Miscellaneous Papers on Sugar-Cane Technology*. Journ. Dept. Agr. P. R. Vol. 3, No. 2: 27-89. 1924.

<sup>10</sup> Figueroa, C. A. The Mottling Disease of Cane and the Sugar Production of Porto Rico. Journ. Dept. Agr. P. R. Vol. 3, No. 4: 35-41. 1919.

fall down, but the decreased production in mosaic zones is very alarming.

The crops for 1920 and 1921 are again high—485,070 tons and 489,817 tons respectively—due to favorable weather, but the increase is to be credited (see Appendix IV) to high increases in zones of no mosaic. Zones with heavy mosaic continued giving ridiculous yields.

And so it continued up to the present, when the varietal factor has brought about the revolution which is the subject of the present paper. Appendix V is a condensed summary of Appendix IV, in which the mosaic influence can be more clearly traced.\*

To sum up the mosaic experience in Porto Rico, the writer feels justified in placing the correct amount of losses at a figure between \$8,000,000 to \$10,000,000. This figure is conservative.

#### **The BH-10(12) and SC-12(4) Canes.**

Both of these cane varieties were produced in Barbados by John R. Bovell, to whom the sugar world owes an eternal debt of gratitude. Strange enough, but by mere coincidence, both canes have B-6835, as a female parent. SC-12(4) bears the name "Saint Croix" instead of the B—meaning Barbados—because it was taken as a young seedling to Sant Croix in a visit which Bovell made to that island in 1912 and presented to the Danish authorities as a gift which later proved to be worth millions.

BH-10(12) was bred in 1910 and a few years later became widely popular in the British West Indies. For details on the behaviour, cultural characteristics and other information on these two canes see Rosenfeld's paper<sup>11</sup> published by the Insular Experiment Station.

BH-10(12) was imported to Porto Rico in 1919, jointly by Guánica Central and the Insular Experiment Station although "Mercedita" claims to have imported some, as early as 1917. SC-12(4) was imported in 1919 by the Federal Experiment Station.

To Central "Mercedita" of Ponce, however, belongs the credit of being the first to realize the importance of the varieties BH-10(12) and SC-12(4) as great sugar-producing canes for the south coast. In Appendix VI is shown the complete record of the acreage in varieties with their respective sugar production since 1917. At that time, fully four-fifths of the total acreage was planted to Cristalina and Otaheiti canes. Practically the entire south coast was planted to these two canes, with the former predominating over the latter.

<sup>11</sup> Rosenfeld, A. H. The BH-10(12) and SC-12(4) Canes. Journ. Dept. Agr. P. R., Vol. 9, No. 3. 1925.

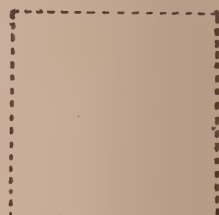
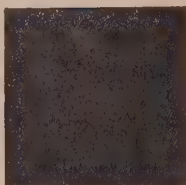
\* Appendix V is not published here.

GRAPHIC REPRESENTATION OF INCREASED PRODUCTIONIN AGUIRRE AND ALLIED CENTRALS

"Aguirre" Central  
5-year Average  
Cristalina

1926  
54% B. H. 10(12)  
S.C. 12 (4)

1927 (Est.)  
90% B.H. 10 (12)  
S. C. 12 (4)



"Cortada" Central  
5-year average  
Cristalina

1926  
45% B.H. 10(12)  
S.C. 12(4)

1927 (Est.)  
89% B.H. 10(12)  
S.C. 12(4)



"Machete" Central  
5-year average  
Cristalina

1926  
46% B.H. 10(12)  
S.C. 12(4)

1927 (Est.)  
96% B. H. 10(12)  
S. C. 12(4)



Grand total for the three Centrals:

5-year Average	12,900 Acres	41,326 Tons Sugar
Crop 1926	12,968 "	54,509 " "
Crop 1927	13,446 "	71,177 " "



Central "Mercedita", however, had already made efforts to secure a better cane, among the Barbados seedlings. B-208 was then attracting attention for its high yields, and the variety was freely propagated, occupying fully 40 per cent of the acreage in 1920 in pure cultures, and evidently more in mixed plantings. But the spectacular appearance of a small lot of a little over 3 acres of BH-10(12) yielding 6.17 tons of sugar per acre and appearing on top of the list as the highest yielder, was destined to change, or rather revolutionize, cane growing in that central, and in the rest of the Island.

In 1921, another prize winner appeared on the stage, SC-12(4). She headed the list with 7.42 tons of sugar per acre with BH-10(12) a close second with 6.80 tons. Cristalina yielded only 4.25, while B-208 and Otaheiti gave still lower yields, 3.57 and 3.36 tons respectively. From then on, BH-10(12) and SC-12(4) were rapidly propagated until the present time when they occupy over 95 per cent of the total acreage in "Mercedita". The great increase in production accrued to these two varieties may be found by the following totals in tons per acre:

Average 5-year period 1920-1924-----	3.46 tons per acre
Crop of 1925-----	5.83 tons per acre
Crop of 1926-----	4.80 tons per acre

The relatively low yield for 1926, is due to the fact that cane cut was fully three months younger, because the 1925 crop was so large that cane was cut and ground until late in June. If a yield, intermediate between 1925 and 1926 is taken as a basis for calculation, say 5.31 tons, its difference with the Cristalina, B-208, Otaheite mixture for the preceding 5-year period would be 1.85 tons increase, which for 3,200 acres would be 5,920 tons of sugar annually. With sugar at \$4.67 New York, this increased production would mean \$532,800 additional gross income.

The record achieved by BH-10(12) and SC-12(4) at the centrals belonging to the "Aguirre" interests, namely "Aguirre" proper, "Machete" and "Cortada" is equally remarkable. Here, the experiment has been carried on a much larger scale, the extension being over 13,000 acres. The change in varieties in these three mills has been so sudden that in less than three years over 90 per cent of the field has been changed from Cristalina to BH-10(12) and SC-12(4). It may be interesting to note here that all the BH-10(12) now planted in the Aguirre fields may be traced back to 13 bags of seed from the Insular Station which Prof. Earle took there in 1921. What this

change means to the Aguirre interests can be evidently demonstrated from the following figures taken from Appendix VII:

**“Aguirre” Central (Administration cane):**

Preceding 5-year average	8,000 acres—3.25 tons*	=25,000 tons
Cristalina		
1926—Cristalina	5,226 acres—3.47 tons	= 18,134 tons
B.H. 10(12)	2,336 acres—5.71 tons	= 13,338 tons
S.C. 12(4)	461 acres—5.84 tons	= 2,692 tons
Total	8,023 acres	35,164 tons
1927—Cristalina	748 acres—3.47 tons	= 2,595 tons
(estimate) B.H. 10(12)	6,433 acres—5.71 tons	= 36,732 tons
S.C. 12(4)	670 acres—5.84 tons	= 3,912 tons
Total	7,861 acres	43,239 tons

**“Cortada” Central (Administration cane):**

Preceding 5-year average	2,400 acres—2.74 tons	= 6,576 tons
Cristalina		
1926—Cristalina	1,351 acres—2.95 tons	= 3,985 tons
B.H. (10)12	544 acres—4.93 tons	= 2,681 tons
S.C. 12(4)	565 acres—4.71 tons	= 2,661 tons
Total	2,460 acres	9,327 tons
1927—Cristalina	310 acres—2.95 tons	= 914 tons
(estimate) B.H. 10(12)	1,627 acres—4.93 tons	= 7,841 tons
S.C. 12(4)	1,130 acres—4.71 tons	= 5,322 tons
Total	3,067 acres	14,077 tons

**“Machete” Central (Administration cane):**

Preceding 5-year average	2,500 acres—3.50 tons	= 8,750 tons
Cristalina		
1926—Cristalina	1,420 acres—3.55 tons	= 5,041 tons
B.H. 10(12)	715 acres—5.55 tons	= 3,968 tons
S.C. 12(4)	350 acres—5.74 tons	= 2,009 tons
Total	2,485 acres	11,018 tons
1927—Cristalina	100 acres—3.55 tons	= 355 tons
(estimate) B.H. 10(12)	2,151 acres—5.55 tons	= 11,938 tons
S.C. 12(4)	277 acres—5.74 tons	= 1,568 tons
Total	2,528 acres	13,861 tons

Plate C shows graphically the increased production of the centrals “Aguirre”, “Cortada” and “Machete”. The 5-year average production, from 1921 to 1925 with Cristalina is shown in comparison

\* Tons of sugar per acre.

with the crop of 1926 and the estimate for 1927. The estimates have been prepared by the writer, based on acreage figures of BH-10(12) and SC-12(4) which have been made available to him.

Other centrals of the south coast are quickly following the examples of "Mercedita" and "Aguirre". Central "Lafayette" owning over 6,000 acres of excellent land in Arroyo and Patillas, and which for the 1926 crop had only 5 per cent improvement with the new canes, has now 47 per cent of its field planted to BH-10(12) mostly. Large *colonos* in Guayama and Salinas are also joining in the movement, and within the coming two years, practically the whole of the southern coastal plain comprising 50,000 acres of rich alluvial *vegas* will be a solid mass of BH-10(12) and SC-12(4).

The benefits derived from these improvements, judging from actual experience, will run into millions of dollars.

It may be of interest to briefly review the behaviour of BH-10(12) and SC-12(4) in other sections of the Island: the Fajardo Sugar Co., for instance. The excellent field work and management of that central is well known in the West Indies. Appendix VIII will show the sugar yields of all varieties since 1916. The Appendix shows clearly the splendid work of D-433 which began to be widely extended in 1920 and occupied fully 60 per cent of the entire acreage in 1925 and 1926. FC-306, a promising seedling, was also profusely planted but it has proven to be very susceptible to the eye-spot disease (*Helminthosporium sacchari*). The increasing sugar yields of Fajardo may be definitely traced to the extension of D-433 and FC-306, as follows:

Year	Variety	Average	Average tons of Sugar per acre (Partial)	Average tons of Sugar per acre (Total)
Average 4-year period 1916 to 1920 .....				2.09
Mostly Cheribon Canes and Caledonia .....				
1920 .....	D-433	222.2 acres	4.07	2.51
1921 .....	D-433	453.3 acres	2.72	1.87 dry year
1922 .....	D-433	1,517.8 acres	3.51	2.39
1923 .....	D-433	2,495.0 acres	2.97	2.35
	F. C. 306	24.8 acres	4.22	
1924 .....	D-433	4,098.9 acres	3.35	2.88
	F. C. 306	71.7 acres	4.31	
1925 .....	B. H. 10 (12)	5.4 acres	5.10	3.34
	S. C. 12 (4)	317.5 acres	4.45	
1926 .....	B. H. 10 (12)	117.1 acres	4.95	3.06
	S. C. 12 (4)	15.0 acres	4.36	
	F. C. 306	703.6 acres	3.75	
	D-433	5,702.4 acres	3.00	

It seems quite safe to predict that in spite of the well-established supremacy of D-433 in the Fajardo district, BH-10(12) will replace it in the *vega* lands of the company. For the present crop of 1927 Fajardo has 506.1 acres of BH-10(12) and 69.9 acres of SC-12(4).

A change of varietal policy in the Fajardo fields will surely influence the entire section of the Island from Central "Loíza" in Canóvanas clear around the entire northeastern section to Humacao.

#### Concluding Remarks.

The history of sugar production in Porto Rico for the past ten years, as reviewed in the present paper, offers an interesting experience to the sugar world—especially to our sister island, Cuba. Nowhere else, has a calamity (like mosaic) brought about such a rational change in the cultivation and improvement of a crop; indeed it has been, as Rosenfeld said, a "blessing in disguise". It has been for us an education, for now, every *colono* in the Island, has awakened to the fact that after all, *only science applied to crop production* can in the end solve his problems. He knows mosaic and fears it; he knows about cane varieties and knows that the ones he has now have originated through the application of botanical science; he uses more fertilizer, he now considers the government expert as his true and unselfish friend, not the "crazy bum running after bugs". What a different man he is now from what he was ten years ago! In fact, the writer can safely asseverate that the work accomplished is worth to the Island from \$10,000,000 to \$12,000,000 every year, and the production limit has not yet been reached.

But this change in our *colono* has been accomplished through years of vicissitude and sad experience. It is only experience in the end that makes a man wise: but how dearly bought has that experience been!

Our larger sister, Cuba, is now facing the mosaic trouble. It has already been severe in certain sections of the Island, while in others it is rapidly spreading. Will she wait for a costly experience to guide her, or will she take advantage of the experience of her smallest sister?



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APPENDIXES AND PLATES

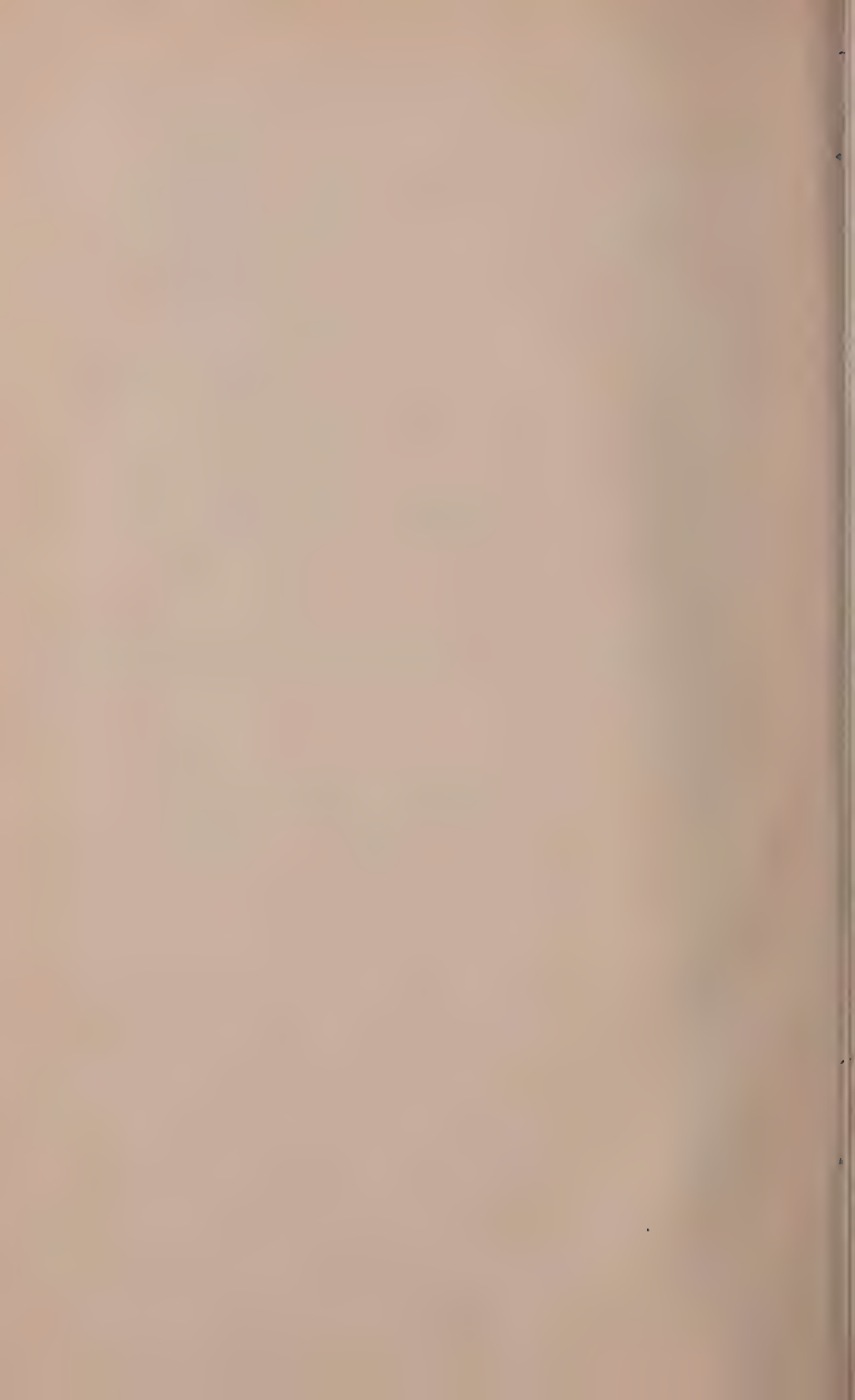
TO ACCOMPANY

"THE VARIETAL REVOLUTION IN PORTO RICO"

BY

CARLOS E. CHARDON  
COMMISSIONER OF AGRICULTURE AND LABOR  
OF PORTO RICO

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## APPENDIX I

## ANNUAL RAINFALL, PORTO RICO

(U. S. Weather Bureau)

(INCHES)

Section	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926
North .....	82.87	86.15	74.60	68.17	67.79	62.15	64.20	73.44	57.69	75.38	60.55	64.41
West .....	78.80	77.66	77.28	80.78	66.79	70.79	80.84	88.56	72.44	76.61	98.85	82.27
East .....	78.78	95.44	77.82	61.50	82.95	75.21	72.87	65.43	63.20	90.98	74.71	61.18
South .....	45.81	70.44	45.02	49.82	53.27	57.07	44.81	40.10	86.18	56.53	44.36	42.80
General average..	71.48	82.42	68.68	68.82	67.70	66.81	65.68	65.63	57.87	74.86	68.87	62.67

## APPENDIX II

CANE HARVESTED IN VARIOUS PROPERTIES OF "RUSSELL & CO." AND GROUND AT GUANICA CENTRAL  
Years 1917-1926

(Courtesy of F. T. Maxwell)

Year	Fortuna Division			Guánica Division			Pagán Division			San Germán Valley		
	Acres	Total Tons	Tons per acre	Acres	Total Tons	Tons per acre	Acres	Total Tons	Tons per acre	Acres	Total Tons	Tons per acre
1917	5,035.81	160,642.34	31.90	3,817.00	137,008.47	35.91	3,168.00	51,448.32	16.24	2,762.97	43,599.67	15.78
1918	4,962.69	144,712.04	29.16	3,764.25	110,621.31	29.39	2,885.95	36,481.83	12.61	2,681.65	31,348.49	11.69
1919	5,095.24	144,297.20	28.32	3,706.75	110,349.95	29.77	2,637.85	29,841.27	11.27	2,028.38	21,419.69	10.56
1920	4,860.13	98,981.16	21.24	3,451.00	84,791.07	24.57	2,264.40	28,350.29	12.52	2,009.96	31,073.98	15.46
1921	4,994.24	137,041.95	27.44	3,269.25	87,125.51	26.65	2,224.27	27,580.95	12.40	2,384.86	31,551.70	13.23
1922	4,908.61	114,665.13	23.46	3,385.25	70,616.32	20.86	2,050.55	31,373.42	15.30	1,971.87	19,876.45	10.08
1923	4,974.15	109,729.75	22.06	2,292.45	51,442.58	22.44	1,724.15	42,552.02	24.68	1,999.54	33,012.25	16.41
1924	5,265.11	137,366.72	26.09	1,644.50	38,431.97	23.37	2,773.69	82,766.91	29.84	2,242.13	54,954.61	24.51
1925	5,354.01	197,670.05	36.92	1,451.50	57,581.01	39.67	3,256.82	85,478.46	26.49	2,574.78	75,930.26	29.49
1926	5,485.85	194,839.63	35.32	1,558.25	60,834.08	39.04	3,192.67	85,308.14	26.72	2,619.01	62,122.92	23.72
Remarks	<i>Irrigated Area</i> No mosaic infection. Mostly "Crystalline" from 1917 to 1922. B H 10 (12) and S. C. 12 (4) the basis of 1925 and 1926 crops.			<i>Irrigated Area</i> Medium mosaic infection in 1920 and 1921. Heavy mosaic in 1922, but vigorous "regrowth" practiced. No disease from 1924 to date. B H 10 (12) and S. C. 12 (4) the basis of 1925 and 1926 crops.			<i>Non-irrigated Area</i> Heavy mosaic starting in 1918 clear thru 1921. Uba began to be extended in 1922 and was the basis of last four crops.			<i>Non-irrigated Area</i> Heavy mosaic starting in 1918 clear thru 1922. Later changed to Uba.		



APPENDIX III  
CENTRAL EUREKA, HORMIGUEROS, P. R.

Cultures of Mosquitoes.

Year	Varieties	Area (acre)	Total yield (per acre)	Total yield (per acre)	Remarks
1920 .....	Cristalina and Rayada	240.00	14.50	3.50	Mosaic controlled
1921 .....	Cristalina and Rayada	150.00	14.50	4.00	Mosaic controlled
1922 .....	Cristalina, Rayada and a little Uba	150.00	14.50	4.00	Mosaic controlled
1923 .....	99% Uba cane	1,700.50	14.16	1.33	Heavy mosaic
1924 .....	96% Uba cane	1,886.87	20.22	1.88	Mosaic controlled by immune Uba
1925 .....	100% Uba cane	2,178.00	19.85	1.72	Mosaic controlled by immune Uba
1926 .....	Mosby Uba. Some B. H. 10 (2), B. C. 12 (4) and P. O. 1 (4)	1,000.00	20.00	1.72	Expect to extend slow B. H. 10 (12) and B. C. 12 (4)

## APPENDIX IV

## SUGAR PRODUCTION OF PORTO RICO FOR THE YEARS 1916 TO 1917, SHOWING THE RELATION OF MOSAIC TO SUGAR CROPS

Mosaic Regions	Number of zones	Crops of 1916 and 1917	Crops in Tons (2,000 lbs.) and percentage compared with 1916 and 1917								
			1918	1919	1920	1921	1922	1923	1924	1925	1926
N <sub>o</sub> . Mosaic	3	204,184.16 T. 100.0%	211,348.48 103.5	191,678.33 93.8	228,847.90 112.0	230,296.90 112.7	200,978.06 98.4	180,336.39 88.3	208,698.53 102.2	299,025.21 146.04	269,744.51 132.1
Slight Mosaic Infection	1	64,157.80 T. 100.0%	58,169.24 90.6	49,810.44 77.6	71,125.25 110.8	67,139.23 104.6	61,139.13 91.2	56,737.89 88.4	65,145.38 101.5	85,958.15 133.9	81,760.22 127.4
Medium Mosaic Infection	2	115,816.90 T. 100.0%	109,785.86 94.7	94,974.50 82.0	100,072.50 85.6	110,538.91 95.4	84,632.37 73.0	83,348.50 71.9	110,079.18 95.0	168,925.92 145.8	161,016.26 139.0
Heavy Mosaic Infection	4	87,032.12 T. 100.0%	64,637.23 74.2	53,732.95 61.7	67,256.76 77.2	63,885.58 73.4	46,005.40 52.8	47,087.50 54.1	53,684.88 61.6	84,234.23 96.7	78,044.67 89.6

NOTE: Appendix V is not published here.

## APPENDIX VI

## CENTRAL MERCEDITA, PONCE, P. R.

(Courtesy of J. H. Giles)

Year	Variety	No. of acres of each variety	Yield of sugar per acre	Remarks
1917	B 1355.....	101.25	4.084	
	B 1030.....	113.25	4.065	
	Seedlings.....	.25	3.963	
	B 3289.....	.75	3.812	
	B 208.....	466.75	3.725	
	Cristalina.....	900.75	3.719	
	Otahite.....	1,085.75	3.398	
	B 6308.....	.25	No analysis	
	Total.....	2,669.90	3.619 <small>Year Average</small>	
1918	B 376.....	1.25	3.733	
	Yellow Cal.....	14.75	3.188	
	D 109.....	25.50	3.175	
	B 208.....	1039.00	3.127	
	Java.....	22.50	3.154	
	Otahite.....	605.50	2.944	
	B. 6308.....	137.75	2.939	
	D 117 y 119.....	15.00	2.926	
	Cristalina.....	698.25	2.879	
	B 1030.....	154.25	2.825	
	B 6450.....	23.75	2.823	
	B 1355.....	76.75	2.684	
	B 1753.....	25.50	2.562	
	D 117.....	74.66	2.224	
	B 347.....	59.00	1.699	
	Total.....	2,902.75	2.965 <small>Year Average</small>	
1919	B 1753.....	59.75	3.219	
	B 6032.....	85.00	3.101	
	B 6308.....	109.75	3.096	
	B 1355.....	96.00	2.851	
	B 208.....	759.00	2.830	
	B 3412.....	3.00	2.721	
	Cristalina.....	902.00	2.679	
	D 117.....	184.98	2.622	
	D 109.....	44.25	2.438	
	Otahite.....	194.00	2.390	
	Java.....	317.50	2.381	
	B 6450.....	48.25	2.395	
	B 1030.....	42.25	2.250	
	B 208 y Java Cristalina.....	19.00	4.516	
	B 6032.....	10.25	4.170	
	Cristalina y Otahite.....	40.50	4.060	
	B 208 y B 1355.....	13.00	4.020	
	B 208 y Cristalina.....	15.00	3.209	
	B 208 y B 6450.....	26.00	3.019	
	Cristalina y B 6450.....	15.00	2.899	
	B 208 y B 6308.....	34.50	2.661	
	Cristalina y B 1355.....	32.50	2.566	
	Mixta.....	103.75	2.385	
	B 208 y D 117.....	5.50	2.294	
	Total.....	2,985.00	2.733 <small>Year Average</small>	

## CENTRAL MERCEDITA, PONCE, P. R.—Continued

Year	Variety	No. of acres of each variety	Yield of sugar per acre	Remarks
1920	B. H. 10 (12) .....	3.09	6.176	
	B 4596 .....	6.75	5.695	
	B 1355 .....	16.25	4.731	
	P. R. 270 .....	12.25	4.122	
	B 376 .....	7.50	3.923	
	Java .....	226.75	3.878	
	B 6032 .....	112.75	3.820	
	D 109 .....	92.75	3.702	
	Otahite .....	87.25	3.664	
	B 208 .....	1,320.00	3.632	
	B 6450 .....	36.50	3.614	
	Cristalina .....	323.25	3.471	
	B 6308 .....	39.75	3.305	
	B 1753 .....	76.75	3.013	
	B 1030 .....	29.25	2.970	
	B 7924 .....	.50	2.770	
	B 208 y B 1809 .....	22.00	6.016	
	Otahite, B 6450 .....	10.75	5.194	
	Java y Cristalina .....	24.00	4.860	
	B 4596 y B 208 .....	6.00	4.589	
	Java y B 6450 .....	12.75	4.338	
	Otahite y B 208 .....	26.00	4.161	
	B 6308 y B 208 .....	3.50	3.998	
	Cristalina B 1355 .....	16.00	4.042	
	Cristalina B 1753 .....	20.00	3.925	
	D 109 y B 208 .....	21.50	3.593	
	Cristalina y B 208 .....	54.00	3.571	
	Otahite y B 347 .....	2.00	3.130	
	Java y B 208 .....	36.25	3.070	
	Mixta .....	116.74	2.995	
	B 6032 y B 208 .....	1,381.55	2.679	
	Caledonia, D 109, Cristalina y B 3412 .....	6.25	.852	
	Total .....	2,832.33	3.624	Year Average
1921	Sta. Cruz 12 (4) .....	17.50	7.427	
	B. H. 10 (12) .....	47.25	6.801	
	Cristalina .....	737.25	4.258	
	B 7924 .....	19.75	4.131	
	B 208 .....	1,100.25	3.576	
	Otahite .....	34.50	3.364	
	D 109 .....	47.75	3.166	
	B 6308 .....	6.00	2.501	
	B 1753 .....	8.50	2.290	
	Java .....	30.00	1.833	
	B 6450, 208 y B. H. 10 (12) ..	22.00	7.284	
	S. C. 12 (4) y B 208 .....	13.50	5.899	
	B. H. 10 (12) y B 208 .....	44.75	4.926	
	P. R. 270 y B 208 .....	6.25	4.501	
	P. R. 270 y Mixta .....	12.00	4.456	
	Mixta .....	681.75	3.741	
	Otahite y B 208 .....	36.25	3.443	
	Java y B 208 .....	11.00	2.441	
	Cristalina, B 208 .....	15.00	1.869	
	D 109 y B 208 .....	21.50	1.302	
	Total .....	2,980.75	3.852	Year Average



## CENTRAL MERCEDITA, PONCE, P. R.—Continued

Year	Variety	No. of acres of each variety	Yield of sugar per acre	Remarks
1922	Java .....	9.00	5.781	Year of drought.
	Otahite, Cristalina y B 208..	5.50	5.560	
	S. C. 12 (4).....	16.75	5.177	
	B. H. 10 (12) Ba 6032.....	8.00	5.084	
	B. H. 10 (12) .....	82.75	4.699	
	B 208 y Cristalina. ....	9.75	3.994	
	B 208.....	34.50	3.958	
	Ba 6032.....	14.75	3.702	
	B. H. 10 (12) .....	105.75	3.675	
	B 208.....	861.00	3.526	
	B. H. 10 (12) y Mixta .....	17.75	3.491	
	D 109.....	41.50	3.401	
	Mixta. ....	1,444.84	3.340	
	B. H. 10 (12), D 208 y B 6450.	10.50	3.288	
	B. H. 10(12), B 208 y S. C. 12(4)	55.50	3.205	
	B 208, B 6450 y.....	158.25	3.853	
	Cristalina.....	22.00	3.180	
	Java y B 208.....	19.00	2.699	Non-irrigated area.
	B. H. 10 (12) .....	44.45	2.226	
	Ba 6032 y Mixta.....	13.00	1.857	
1923	P. R. 270 y B 208.....	6.25	1.385	Year of drought.
	Total.....	3,061.04	3.386	Year Average
1923	Mixta y Ba 6032.....	12.50	6.338	Year of drought.
	D 208, B.H. 10 (12) y S. C. 12(4).....	18.50	5.553	
	Ba 6032.....	7.50	4.844	
	P.R. 270 y G. C. 347.....	3.50	4.476	
	S.C. 12(4) .....	165.00	4.382	
	B.H. 10(12).....	514.50	3.809	
	Mixta y Otahite.....	10.00	3.491	
	B.H. 10(12) y S.C. 12(4) . .	36.50	3.279	
	B.H. 10(12) y B 208.....	92.75	3.309	
	Otahite.....	3.00	3.231	
	Ba 6032 y Mixta. ....	170.50	2.954	
	B 208 .....	414.25	2.823	
	Ba 6032 y Mixta .....	8.00	2.615	
	D 109.....	4.00	2.452	
	P.O.J. 105 y Japonesa.....	9.50	2.179	
	Japonesa.....	6.84	1.638	
	Mixta .....	1,584.75	2.773	
	Cristalina.....	8.00	1.031	
	Total. ....	3,071.09	3.106	Year Average

## CENTRAL MERCEDITA, PONCE, P. R.—Continued

Year	Variety	No. of acre of each variety	Yield of sugar per acre	Remarks
1924	Ba 6032.....	3.50	5.631	Year of drought.
	S.C. Mixta.....	19.75	5.221	
	B.H. 10(12), S.C.12(4) y Mixta.....	40.00	5.053	
	B.H. 10(12) y Mixta.....	31.75	4.561	
	B.H. 10(12).....	67.45	4.526	
	B.H. 10(12).....	1,013.82	4.057	800 lbs. of fertil- izer per acre.
	B.H. 10(12), Mixta, Japone- sa y P.O.J. 105.....	22.25	3.861	
	S.C. 12(4).....	250.13	3.470	
	Patito.....	25.66	2.896	
	Mixta.....	1,576.94	2.819	
	Japonesa.....	13.55	2.444	
	Japonesa y Mixta.....	22.10	1.768	
	Abandonada.....	34.75	0.928	
	Total.....	3,121.79	3.353	Year Average
1925	Mixta y B. H. 10 (12).....	39.55	8.386	Rainfall this year was more abund- ant and better distributed. The period of growth was longer. Har- vest of 1924 last- ed until May 15, and that of 1925 lasted until July 9.
	P. O. J. y Mixta.....	13.50	8.101	
	B. H. 10 (12) y S. C.....	109.70	7.473	
	S. C. 12 (4).....	371.90	6.583	
	B. H. 10 (12).....	2,119.82	5.804	
	B. H. 10 (12) y Ba 6032.....	11.00	5.533	
	Mixta.....	485.07	5.205	
	Japonesa.....	67.95	4.447	
	P. O. J. 105.....	15.25	4.150	
	B. 208 y B. H. 10-12.....	6.75	3.881	
	Japonesa y Mixta.....	27.99	3.563	
	B. H. 10 (12) y S. C. 12 (4) y Mixta.....	9.65	3.231	
	Ba 11569.....	.75	1.841	
	Total.....	3,278.88	5.833	Year Average
1926	Ba 11569 y 6032.....	7.80	7.718	There was less rainfall precipi- tation this year than the previ- ous one.
	B. H. 10 (12) y Japonesa.....	10.25	7.060	
	Ba 6032.....	17.25	6.865	
	Ba 11569.....	18.80	5.770	
	B. H. 10 (12), Japonesa, Mixta y S. C.....	11.00	5.678	800 lbs. of fertil- izer used per acre.
	G. C. 1237.....	2.60	5.290	
	Japonesa y Java.....	7.50	5.112	
	B. H. 10 (12).....	2,577.89	4.997	
	Ba 11569, B. H. 10 (12), y S. C. 12 (4).....	35.40	4.893	Cane harvested was three months younger.
	S. C. 12 (4).....	397.70	4.101	
	Japonesa.....	75.52	4.071	
	B. H. 10 (12) y S. C.....	160.40	3.785	
	Mixta.....	69.20	3.381	
	B. H. 10 (12) y Ba 6032.....	11.00	2.517	
	Total.....	3,402.31	4.801	Year Average

## APPENDIX VII

## CENTRALS OWNED BY THE AGUIRRE INTERESTS

(Courtesy of C. L. Carpenter)

Central "Aguirre", Salinas, P. R.

Year	Variety	No. of acres of each variety	Yield of sugar per acre	Remarks
1917	Cristalina and Others .....	8,775.00	3.47	Yield calculated on both admin- istration and co- lono cane.
1918	Cristalina and Others .....	8,631.81	3.22	Yield of administration cane only.
1919	Cristalina and Others .....	8,571.73	3.39	Yield of administration cane only.
1920	Cristalina and Others .....	8,346.97	3.49	Yield of administration cane only.
1921	Cristalina and Others .....	8,071.70	3.47	Yield of administration cane only.
1922	Cristalina and Others .....	7,723.22	3.22	Yield of administration cane only.
1923	Cristalina and Others .....	7,838.69	2.79	Yield of administration cane only.
1924	Cristalina and Others .....	7,849.00	2.44	Yield of administration cane only.
1925	Cristalina and Others . . . . .	8,270.79	4.10	Year Average
	B. H. 10 (12) .....	247.79	4.05	
	S. C. 12 (4) .....	33.29	4.75	
	Total . . . . .	8,551.87	4.10	
1926	Cristalina and Others .....	5,226.14	3.47	Year Average
	B. H. 10 (12) .....	2,336.90	5.71	
	S. C. 12 (4) .....	461.39	5.84	
	Total . . . . .	8,024.43	4.23	

## CENTRALS OWNED BY THE AGUIRRE INTERESTS—Continued

## Central "Cortada", Santa Isabel, P. R.

Year	Variety	No. of acres of each variety	Yield of sugar per acre	Remarks
1920	Cristalina and Others .....	2,662.11	3.10	
1921	Cristalina and Others .....	2,696.78	2.99	
1922	Cristalina and Others .....	2,620.17	2.48	
1923	Cristalina and Others .....	2,343.80	1.98	
1924	Cristalina and Others .....	2,179.01	2.45	
1925	Cristalina, Japonesa B. H. 10 (12) y S. C. 12 (4) .....	2,460.06	3.63	
1926	Cristalina .....	1,351.85	2.95	
	B. H. 10 (12) .....	544.37	4.93	
	S. C. 12 (4) .....	565.31	4.71	
	Total .....	2,461.53	3.79	Year Average

## Central "Machete", Guayama, P. R.

1921	Cristalina .....	2,556.00	3.21	
1922	Cristalina .....	2,321.00	3.61	
1923	Cristalina .....	2,292.00	3.22	
1924	Cristalina .....	2,489.00	3.14	
1925	Cristalina .....	2,452.49	4.27	A lot of B. H. and S. C. cane was used for seed.
	B. H. 10 (12) .....	63.98	4.21	
	S. C. 12 (4) .....	8.49	3.15	
	Total .....	2,524.96	4.27	
1926	Cristalina and Others .....	1,420.25	3.55	
	B. H. 10 (12) .....	715.85	5.55	
	S. C. 12 (4) .....	350.67	5.74	
	Total .....	2,486.77	4.43	Year Average



## APPENDIX VIII

## FAJARDO SUGAR COMPANY, FAJARDO, P. R.

(Courtesy of J. Bird Arias)

Year	Variety	No of acres of each variety	Yield of sugar per acre	Remarks
1916	D 109.....	46.21	3.93	
	D 109.....	20.50	2.97	
	B 6450.....	22.95	3.76	
	B 6450.....	.47	4.48	
	Yellow Caledonia.....	207.10	3.77	
	Yellow Caledonia.....	70.41	3.42	
	Sealy Seedling.....	33.35	4.08	
	Sealy Seedling.....	8.65	2.17	
	B 3412.....	8.88	4.80	
	B 3412.....	.46	2.74	
	B 376.....	23.01	3.98	
	B 376.....	8.59	4.15	
	D 448.....	6.25	1.61	
	B 208.....	1.55	2.42	
	B 208.....	16.08	3.00	
	G. C. 67.....	3.00	3.50	
	G. C. 67.....	.40	4.55	
	B 109.....	11.86	3.59	
	G. C. 759.....	7.89	2.24	
	G. C. 759.....	1.08	3.29	
	D 357.....	.04	2.	
	D 117.....	8.56	3.09	
	D 117.....	6.17	3.43	
	B 1355.....	7.81	2.42	
	B 1355.....	6.54	3.95	
	B 347.....	9.39	2.48	
	B 347.....	.42	.97	
	B 3405.....	.29	2.41	
	W. Transparent.....	6.17	4.04	
	W. Transparent.....	.41	2.41	
	B 3289.....	10.57	2.95	
	B 1030.....	.54	3.23	
	D 116.....	.85	4.70	
	Cavangerie.....	.29	2.33	
	D 433.....	4.05	2.75	
	D 433.....	4.45	4.24	
	B 4596.....	8.52	3.77	
	D 1111.....	.18	2.92	
	G. C. 81.....	.44	4.77	
	G. C. 101.....	6.70	4.88	
	G. C. 698.....	1.10	4.78	
	G. C. 47.....	1.00	7.20	
	G. C. 54.....	2.68	4.47	
	G. C. 701.....	1.50	5.11	
	Mixed.....	8,337.18	2.431	
	Total.....	8,924.54	2.50	Year Average
1917	Mixed.....	90%		
	Others.....	10%	9,277.66	1.61
				Yield of various varieties not calculated

## FAJARDO SUGAR COMPANY, FAJARDO, P. R.—Continued

Year	Variety	No. of acres of each variety	Yield of sugar per acre	Remarks
1918	B 3578.....	.95	4.34	
	B 6388.....	.55	4.64	
	B 3412.....	10.42	3.24	
	B 208.....	2.99	5.57	
	White Transparent.....	8.87	5.31	
	B 3405.....	11.89	3.08	
	Caledonia Amarilla.....	270.42	2.95	
	Sealy Seedling.....	30.30	2.99	
	D 433 .....	8.84	2.62	
	D 448.....	14.14	3.09	
	G. C. 101.....	9.07	3.26	
	B 1355.....	9.87	2.70	
	B 109.....	12.77	2.84	
	D 109.....	70.64	2.57	
	B 4596.....	20.38	2.61	
	B 3289.....	4.38	2.04	
	B 376.....	119.92	2.18	
	B 347 .....	10.04	2.12	
	B 6450.....	59.95	1.80	
	Mixed, Cristalina.....	79.63	1.92	
	D 117.....	35.61	1.68	
	D 116.....	.85	1.87	
	B 3922.....	18.56	1.75	
	Mixed.....	6,882.58	2.287	
	Total.....	7,693.62	2.323	Year Average
1919	G. C. 47.. .....	2.38	5.12	
	D 433 .....	17.72	3.71	
	B 6450 .....	2.21	3.24	
	G. C. 67.....	.72	3.15	
	G. C. 101.....	.55	3.13	
	G. C. 101.....	12.50	2.68	
	D 117.....	86.19	2.66	
	Yellow Caledonia .....	489.45	2.50	
	B 347 .....	5.54	2.50	
	White Transparent.....	3.77	2.33	
	B 4596 .....	13.75	2.39	
	D 109.....	265.42	2.36	
	Otahiti .....	1.07	2.36	
	D 448 .....	24.50	2.35	
	B 1355.....	4.08	2.23	
	B 3412.....	22.33	2.21	
	B 3405.....	19.74	2.15	
	B 109.....	12.92	2.12	
	B 208 .....	6.31	1.98	
	Sealy Seedling.....	321.76	1.90	
	Cristalina.....	60.48	1.82	
	B 376 .....	66.37	1.77	
	B 3922.....	7.84	1.62	
	D 110 .....	2.82	1.30	
	Mixed.....	7,473.89	1.969	
	Total.....	8,924.31	2.020	Year Average

## FAJARDO SUGAR COMPANY, FAJARDO, P. R.—Continued

Year	Variety	No. of acres of each variety	Yield of sugar per acre	Remarks
1920	D 433 .....	222.20	4.07	
	Cavangerie.....	.25	3.87	
	B 3412.....	31.99	3.62	
	G C 101.....	5.88	3.33	
	D 116.....	2.82	3.20	
	Otahite.....	1.66	2.85	
	B 3405.....	13.79	2.80	
	W. Transparent.....	1.87	2.75	
	Yellow Caledonia.....	417.82	2.73	
	B 6450.....	26.88	2.69	
	B 4596.....	8.40	2.68	
	Sealy Seedling.....	270.80	2.64	
	D 117.....	58.20	2.63	
	B 1355.....	4.08	2.44	
	B 109.....	10.29	2.32	
	D 109.....	276.28	2.14	
	D 448.....	18.84	1.99	
	B 347.....	4.39	1.90	
	B 376.....	37.59	1.77	
	B 208.....	6.32	1.55	
	Mixed.....	8,868.55	2.463	
	Total.....	10,288.90	2.317 <small>Year Average</small>	
1921	D 433.....	453.35	2.72	
	B 3412.....	30.69	2.79	
	Yellow Caledonia.....	455.42	2.13	
	Otahite.....	1.07	2.18	
	D 117.....	45.35	2.15	
	B 1355.....	4.08	2.54	
	D 448.....	12.85	1.75	
	D 109.....	174.36	1.61	
	B 3405.....	15.45	1.61	
	G C 101.....	4.88	1.95	
	B 109.....	10.42	1.82	
	B 4596.....	8.40	1.69	
	B 347.....	4.39	1.72	
	Sealy Seedling.....	208.79	1.40	
	White Transparent.....	1.87	1.26	
	B 6450.....	38.88	1.62	
	B 376.....	26.09	1.21	
	Mixed.....	8,105.42	1.855	
	Total.....	9,601.76	1.875 <small>Year Average</small>	
1922	D 433.....	1,517.81	3.51	
	D 109.....	243.19	2.56	
	B 3412.....	30.34	2.71	
	B 3405.....	3.80	2.14	
	Yellow Caledonia.....	322.71	2.18	
	B 1355.....	4.08	1.89	
	D 117.....	41.79	2.03	
	B 6450.....	20.12	1.98	
	B 347.....	4.48	1.90	
	Sealy Seedling.....	89.96	1.79	
	B 109.....	10.15	1.20	
	Mixed.....	6,326.02	2.16	
	Total.....	8,515.02	2.16 <small>Year Average</small>	

## FAJARDO SUGAR COMPANY, FAJARDO, P. R.—Continued

Year	Variety	No. of acres of each variety	Yield of sugar per acre	Remarks
1923	D 433.....	2,495.06	2.97	
	Yellow Caledonia.....	181.81	2.13	
	D 109.....	225.30	1.87	
	B 3405.....	9.30	1.75	
	B 3412.....	14.71	1.77	
	Seely Seedling.....	16.69	1.65	
	F C 137.....	10.28	4.97	
	F C 306.....	24.88	4.22	
	F C 214.....	6.94	4.06	
	F C 262.....	6.40	3.65	
	F C 299.....	13.85	3.79	
	F C 90.....	12.87	2.84	
	F C 199.....	18.83	3.06	
	F C 148.....	40.38	2.77	
	F C 101.....	19.26	2.71	
	F C 88.....	10.87	2.68	
	F C 86.....	11.02	2.08	
	Mixed.....	4,654.84	2.02	
	Total.....	7,773.29	2.355	Year Average
1924	F C 306.....	71.76	4.31	
	Striped Caledonia.....	5.61	3.79	
	S. C. 12 (4).....	3.57	4.10	
	F C 214.....	20.04	3.83	
	F C 299.....	137.06	3.59	
	B. H. 10 (12).....	4.63	3.78	
	F C 137.....	15.23	3.59	
	D 433.....	4,095.90	3.35	
	F C 199.....	68.82	3.23	
	F C 140.....	26.05	2.86	
	Yellow Caledonia.....	111.52	2.10	
	D 109.....	101.58	1.98	
	B 3405.....	3.80	1.38	
	Mixed.....	3,379.59	2.42	
	Total.....	8,045.16	2.889	Year Average
1925	F C 306.....	317.58	4.45	
	Striped Caledonia.....	14.20	3.73	
	B. H. 10 (12).....	5.46	5.10	
	F C 137.....	24.09	3.64	
	D 433.....	5,481.06	3.63	
	S C 12 (4).....	1.50	4.61	
	F C 214.....	44.70	3.58	
	F C 299.....	142.30	3.05	
	Yellow Caledonia.....	124.66	2.51	
	F C 140.....	34.98	2.71	
	F C 199.....	72.91	2.78	
	D 109.....	24.02	2.18	
	Mixed.....	2,287.46	2.42	
	Total.....	8,452.76	3.345	Year Average



## FAJARDO SUGAR COMPANY, FAJARDO, P. R.—Continued

Year	Variety	No of acres of each variety	Yield of sugar per acre	Remarks
1926	B. H. 10 (12) .....	117.09	4.95	
	S. C. 12 (4) .....	14.98	4.36	
	Striped Caledonia .....	25.73	3.80	
	F C 306 .....	703.59	3.75	
	F C 137 .....	22.76	3.02	
	D 433 .....	5,702.40	3.00	
	F C 140 .....	43.99	3.08	
	F C 214 .....	67.14	2.99	
	F C 199 .....	102.00	2.99	
	F C 299 .....	175.63	2.63	
	Yellow Caledonia .....	35.87	2.33	
	Mixed .....	1,293.53	2.836	
	Total .....	8,304.71	3.059	Year Averag



## A MONOGRAPH OF SUGAR-CANE VARIETIES

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In this JOURNAL, Vol. III, No. 2, under date of April, 1919, there appeared a preliminary paper by Mr. F. S. Earle on "Sugar-Cane Varieties of Porto Rico". This excellent study was followed by that masterpiece in cane varietal studies, "Sugar-Cane Varieties of Porto Rico—II" by the same author, as Vol. V, No. 3 of the JOURNAL, under date of July 1921, which presented the results obtained by Mr. Earle up to that date in the continued study of this vitally important subject. Additional data was therein given concerning varieties discussed in the previous paper, as well as a considerable number not touched upon in the first studies. In this latter monumental work Mr. Earle made such an excellent preliminary statement and so well outlined the history of cane varieties in Porto Rico that it has been decided by the present author to use that part of Mr. Earle's paper in its entirety in this, adding only a few illustrations to bring out more clearly some points in the descriptions.

In Vol. IV, No. 3, under date of July, 1920, Mr. Earle published a very useful work entitled "An Annotated List of Sugar-Cane Varieties", which contained a remarkably complete alphabetical index of all of the names applied to sugar-cane varieties in different parts of the world as far as they could be found in the literature accessible to him, this having been found necessary by Mr. Earle in his attempts to trace the history of the older varieties found in Porto Rico, due to the enormous confusion existing in the use of varietal names in cane literature. This study, as Mr. Earle pointed out, with the synonymy which it was possible to trace with more or less certainty, served to clear up a number of points which had hitherto been most obscure.

The present paper is an attempt to summarize the results obtained by the author in following up Mr. Earle's pioneer work on varieties of sugar cane and he has attempted to maintain the same form of description and the identical treatment given to the subject by Mr. Earle in his previous and most valuable papers. It was the writer's first intention to call this paper "Sugar-Cane Varieties of Porto

Rico—III'' and include therein only those varieties which he has studied in addition to those already touched upon by Mr. Earle, but, due to the facts that Mr. Earle's "Sugar-Cane Varieties of Porto Rico—II" has been for some time completely exhausted and that the economic status of a number of varieties—notably B.H.—10(12) and S.C.—12/4 has changed so materially in the past five years in Porto Rico, it was decided to make the present paper include not only the varieties studied since Mr. Earle's departure from the Station, but all of those described by him in his earlier papers. Hence, the present paper is a compendium of all of the varieties of cane described in Porto Rico to date, those described by Mr. Earle being indicated in the text by an asterisk.

Inasmuch as this whole work is based on work originated and carried out by Mr. Earle, the author would have preferred to have brought it out jointly with him, but it was finally decided that, inasmuch as Mr. Earle has not had the opportunity of seeing the larger number of varieties herein described under Porto Rico conditions, the writer could hardly make him jointly responsible for the possible—and probable—errors in the technical descriptions included in this work, nor for what might turn out to be misconceptions of the economic value of this or that variety under determined conditions. He does wish to make it very clear, however, that he makes no claim for originality in bringing out the present paper and to repeat that herein he has simply endeavored to bring up to date the work so ably initiated by Mr. Earle. To the man who planned and originated these labors should go all the credit for whatever the present studies may be worth—the author wishes to emphasize the fact that Mr. Earle was the pioneer in these investigations and that it has been a comparatively easy matter for him to follow a trail so clearly blazed, particularly as he has been able to get together a much larger and more representative collection than that which Mr. Earle had available.

The writer wishes to acknowledge, also, the great assistance rendered him by Mr. Luis Serrano, the Assistant Agronomist at the Station, who has participated with him in all descriptions of varieties made and whose keen sense of values and fine perception of important minute structural differences have been of great utility in making these descriptions more accurate and exact. Mr. Serrano's willingness to "be on the job" at any time has aided materially in bringing this work to an earlier conclusion than would have otherwise been possible.



Another debt of gratitude which the author wishes to acknowledge is that to Mr. W. C. Dreier, Manager of the Hatillo Fruit Farm. Interested in cane varieties by the contagious enthusiasm of Mr. Earle, Mr. Dreier obtained from him when Mr. Earle left the Station quite a complete lot of the varieties at that time growing there and he has cared for, experimented with and made the most careful notes on these and other varieties which he has added to the collection from time to time, in a practical as well as scientific manner which it would have been well nigh impossible for us to have attained with our limited extension of land and unlimited other duties at the Station. Experimentation from the point of view of the strictly practical cane planter, who is making a logical effort to obtain just the varieties which will give him the largest financial return under each of his distinct sets of conditions, is of exceptional value in cane varietal work and close association with Mr. Dreier in the management of his varieties for the past three years has enabled the author to obtain a point of view on the commercial side of the question far broader, he feels sure, than would have been possible without this whole-hearted cooperation from Mr. Dreier.

To Mr. Mario Brau de Zuzuarregui, who has so carefully and painstakingly prepared the colored illustrations which accompany this report, and who has at all times been so amenable to suggestions by the writer, acknowledgment is also due.

And last, but by no means least, the writer wishes to acknowledge the many suggestions and exceptional cooperation which he has received while preparing this work for the past three years from Commissioner of Agriculture Carlos E. Chardón and the Director of the Insular Station, Mr. Feo. López Domínguez. Without the constant aid received from both of these gentlemen, this report would still be far from conclusion.

## GENERAL REMARKS

By F. S. EARLE

The selection of the proper variety for each local planting is the one most important factor in sugar-cane production. Its importance is strangely overlooked by the average planter, who only too often plants his one favorite kind in all kinds of soils and under all kinds of circumstances with no thought of its adaptability; or, as often happens in Porto Rico, he plants a miscellaneous mixture of kinds in the same field. Neither plan will give really satisfactory results. In the present state of the sugar market (January 1921) the most painstaking care is necessary at all points in order to secure a reasonable profit. Each variety is particularly adapted to certain soils and certain conditions and will only give its best results when these requirements are complied with. It is, however, in connection with insect pests and diseases that the question of variety becomes most important. Some are susceptible to each of these plagues while others are more or less resistant or even immune. In every important cane-growing country in the world the industry has been seriously threatened at one time or another by the sudden appearance of some one of these plagues. In each case, after heavy losses and much effort, the situation has been saved by the substitution of more resistant kinds for the ones previously in general cultivation. Aside from strictly preventive measures no practical remedy is known for any sugar-cane diseases except that of substituting some more resistant kind. As this fact came to be realized it lead to the searching of all sugar-growing countries for desirable kinds and the establishment of large living collections, first in Mauritius, then in Java and later in Australia, Brazil, Jamaica, Louisiana, Hawaii and various other countries. Then came the discovery that sugar cane produced fertile seed and with it the making of new seedling kinds. For the past twenty years this has so absorbed the attention of sugar-cane investigators that the older varieties have been forgotten long before most of them had been properly tested and their adaptability determined. This is unfortunate. The very fact that those are kinds that had merit enough to survive for generations under the crude agricultural practices of the country of their origin demonstrates their usefulness. When first brought to a new country and planted in trial grounds they have often, perhaps, found uncongenial surroundings and so have

made a poor showing and been discarded, when under slightly different conditions they would have succeeded admirably. Thus the Uba cane when first brought from Brazil to Mauritius in 1869 was noted as "worthless", but it has since saved the industry in Natal, where it is the only cane planted and (under the name of Kavangire), it has been of the greatest assistance in freeing Western Porto Rico from the mosaic disease, to which it proves to be almost absolutely immune. It is not intended to belittle the importance of the work of producing and testing new seedling varieties. It has already done much for the sugar industry in many parts of the world and will unquestionably do much more in the future. It is only wished to call attention to the importance of continuing to test the older kinds until their adaptability is fully determined for all conditions and for all purposes. //

In the first paper on sugar-cane varieties of Porto Rico the subject-matter was divided under two distinct headings, the one dealing with the cultural characteristics and value of the different varieties and the other giving an attempted technical description, thus treating of them taxonomically or botanically. This method has certain obvious advantages, but it was disregarded in the second paper, where all the available data regarding each variety was grouped under the one heading, an arrangement which it is believed is on the whole more convenient for reference.

#### THE DEMONSTRATIONS OF VARIETIES

In a previous paragraph attention has been called to the unfortunate premature abandonment of the testing and study of many of the older cane varieties and the centering of attention on the production of new seedlings. This has naturally followed from the prevailing belief that existing varieties quickly and inherently deteriorate and run out. This idea is everywhere found in the literature and the view is widely held that this is why a change of variety has become necessary in so many sugar-producing countries. This idea is not confined to sugar-cane varieties. It has been widely accepted as a fact that cultivated varieties of plants of all kinds that are continuously propagated asexually have, like individual animals, their definite period of life—that they flourish for a certain length of time, each according to its special nature, then degenerate and finally disappear from cultivation or die. Horticultural writers in particular seem to be firm in this belief. Innumerable instances of it could be cited, particularly in the literature of potato and strawberry varieties. Curiously enough, this belief has been considered

as axiomatic and no facts have been brought forward in proof of it that could not more easily be explained on some other basis. The fact seems to be that most of the so-called cases of deterioration or degeneration have been caused either by climatic changes, soil exhaustion or the increase in insect pests and disease to which the variety in question was susceptible, and not by any change in the nature of the variety itself. Often, too, varieties have been abandoned because of the introduction of better and more profitable ones. Most cultivated varieties have been selected on account of their adaptability to some special local need. As a rule they are only adapted to a narrow range of cultural conditions, and when these change or when they are taken to a different environment they suffer. Occasionally a variety is found adapted to a wide range of conditions and these remain long in cultivation, extend over great areas, and become recognized as the standard varieties of their kind. Such kinds show no signs of degeneration unless confronted with radically changed conditions of growth. Ben Davis apples, Bartlett pears, Elberta peaches, Concord grapes, and Navel and Valencia oranges are growing today on countless thousands of acres with the widest possible geographical distribution and with no sign whatever of deterioration. Under favorable cultural conditions they show the same vigor and productiveness that they did many years ago at the time of their first introduction. Cultivated varieties of plants may degenerate; it would be difficult to prove the contrary, but the fact remains that no evidence has been brought forward to show that they actually are degenerating except through the action of purely external causes. On the other hand, much evidence could be cited to show that they may be constantly improved by the continued selection of bud variations. This is a phase of the question, the great importance of which seems to have only been appreciated by a very few investigators. Shammel's work with citrus varieties in California may be cited as one of the few instances in point.<sup>1</sup>

To return to sugar cane: The Caña Blanca or Otaheite is the one usually cited as a case of deterioration. Scarcely an article on cane varieties has been written during the last fifty years that does not assume the degeneration of the Otaheite as an accepted fact. It is unfortunately true that it has been found necessary to abandon the cultivation of this once popular variety in one after another of most

<sup>1</sup> Shammel's bud-selection works on sugar cane in Hawaii, however, have not been so strikingly successful.—A. H. R.

all the sugar-producing countries.<sup>1</sup> This forced change of varieties has only too often been accompanied by heavy financial losses and sometimes by the threatened ruin of the sugar industry. This does not prove, however, that the Otaheite had degenerated. Its nature today seems much the same as it was a century and a quarter ago, when it so dramatically replaced the old Caña Criolla that was then universally cultivated. As always, it is a cane adapted to a narrow range of cultural conditions. It requires a well-aerated soil abundantly supplied with vegetable matter. These conditions are admirably supplied by virgin forest lands. It was on such lands that Otaheite was first planted in the West Indies and on such lands it gained its great reputation. When it became necessary to plant cane on old compact lands where the humus and other elements of fertility were partially exhausted, then the Otaheite failed, and failed miserably. Its root system is not adapted to these conditions and it is unduly susceptible to most cane diseases. Planted today on virgin lands it grows with its old-time vigor. It is *conditions* that have changed. The soil has deteriorated, but not the Otaheite cane. It is only a striking example of the necessity of selecting varieties adapted to the particular soil conditions under which they are to grow.

The Cristalina may be taken as another example to show that deterioration is not an inherent characteristic of cane varieties. In so far as we can trace its history this is as old a cane as the Otaheite. Coming originally from Java it has been carried to all sugar-cane growing countries. It seems to have been brought to the West Indies at about the same time as the Otaheite and to have had about the same distribution. It was not a favorite with the early planters since it did not mill quite as easily as the Otaheite and its juices were harder to handle under the old open-kettle methods. It was, however, so much hardier and was adaptable to so much wider a range of conditions that in one country after another it has quite completely driven out and replaced the Otaheite, notwithstanding the prejudices of the older planters, and is today under one name or another considered as the standard cane in many of the largest sugar-producing countries. This cane is adapted to a much wider range of soil conditions than the Otaheite and is more resistant to most insects and diseases. It is easily our one best general-purpose

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<sup>1</sup> Peru is the notable exception to this rule.—A. H. R.



cane. That it is not degenerating may be proven by its continued good behavior in thousands of fields and in many countries, in fact, wherever reasonably good cultural conditions are still found. The recorded yield of an average of 81 tons per acre on a 40-acre field of the irrigated lands at Aguirre some years ago gives testimony to its continued vigor and productiveness. Although so much more hardy and resistant than Otaheite, it is however, failing in many localities from the same causes; mainly from root disease induced by unduly compacted and exhausted soils and the failure to give rational tillage. It is being replaced by other kinds, not because it has deteriorated but because other kinds have been found that are still more resistant, or that are better adapted to the changed soil conditions.

#### THE POSSIBILITY OF IMPROVING EXISTING VARIETIES THROUGH THE SELECTION OF BUD VARIATIONS

The belief expressed in the previous paragraphs that varieties are not inherently deteriorating does not imply that they are necessarily fixed and immutable. In fact, the contrary is known to be the case. Change is the universal law of living beings. Within limits like produces like, but this inheritance is not absolute. It is true, also, that plants propagated asexually from buds resemble the parent form much more closely than those propagated from true seeds, but no two buds even from the same shoot will produce plants that are absolutely identical. Sporting, a sudden and pronounced form of bud variation, is known to occur with many plants. It seems to be particularly prevalent in the tropics.<sup>1</sup> Several striking cases of it among different ornamental plants have fallen under the writer's observation in Cuba. It is known to have been the origin of many well-marked horticultural varieties. The not infrequent occurrence of striking color variants in sugar cane is a well-known fact and the case of the three differently colored forms of the Cheribon cane, Rayada, and Cristalina and Morada, has been often cited. An exactly similar case occurs with the Tanna canes, Yellow Caledonia, Black Tanna and Big Ribbon or Striped Tanna being color variants of the same stock. Otaheite has produced two differently colored striped bud sports, one yellow and green and one yellow and red, and the latter has sported again to produce a solid colored red cane. Here we have four distinct color forms from the one stock. At least four striking instances of striped sports appearing in cultures of self-colored canes have been observed by the writer in Porto Rico. In

three of the cases the striped sports were planted and the resulting progeny has uniformly been striped. The fact that canes are known to produce such striking differently colored bud sports at once suggests the question as to whether or not they are not also sporting in other directions which perhaps may have more practical importance though less easily detected by the eye. Are there not "sports" having a greater or a lesser sugar content than the normal? or do not some individuals have greater vigor and greater resistance to certain diseases than the others? There are many indications that this may be the case; and the inherent probabilities all favor the idea of such variations, or of such mutations if it is preferred to so consider them. The idea of a possible inheritable variation in sugar content has occurred to many investigators and there have been numerous attempts at experimental proof. Such work has been done by Edson and Stubbs in Louisiana, d'Albuquerque in Barbados, Watts and various other workers in the other British West Indies, Rosenfeld in Argentina, Greimly in Australia and particularly by Kobus in Java. Various methods have been followed, mostly based on the idea of the chemical selection of the stalks richest in sugar. In some cases the attempt has been made to find and isolate unusually rich strains from which to propagate, but Kobus' method looked toward the general improvement of the variety by mass selection based on the use of those seed pieces showing the greatest specific gravity, this usually being an indication of high sugar content. He seemed to get very favorable results, but later workers in Java consider his methods impractical. In fact, no really practical results have come from any of these efforts. One of the greatest difficulties in this line of work is the fact that sugar content is dependent not only on the inherited characteristic of the cane, but to a much greater degree on soil and weather conditions with their influence on the maturity of the plant. Age is another important factor. Different stalks in the same stool when of different age and maturity differ widely in sugar contents, as do the different joints in the same stalk. This makes any form of chemical selection a difficult problem, but it by no means proves it to be insoluble. The question is worth further careful and continued effort.

The other phase of the problem of selection within the variety, that of trying to find and propagate strains or variants that show greater vegetative vigor and more resistance to specific diseases, has been strangely neglected, the only reference found being an account

of an attempt in Java to find strains of Black Cheribon that would resist Serch. This line of work would be much easier to carry out than the other since such valuable strains, if they do exist, may be detected by the eye by a careful inspection in the fields exposed to the unfavorable conditions which it is desired to combat, whether this is soil exhaustion, root disease, gum disease, mosaic or any other specific trouble. It is a matter of common knowledge and observation that in such exposed fields there are always certain stools that seem to be thriving better than their neighbors. In most cases this simply means a better local soil condition, but the possibility always presents itself that some of these better stools may represent inherently different strains. This can only be proven by taking seed cuttings from these promising stools and planting them side by side where they will be exposed to the same unfavorable conditions. As a case in point, on the older cane lands of Cuba where the practice of long ratooning prevails and where little attention is given to replanting the vacancies in old fields, areas are frequently found where the cane has died out from root disease. These open areas, or *sabanas* as they are locally called, often reach an area of an acre or more before the field is abandoned and plowed up.

Almost always, however in the midst of these open grassy places will be found an occasional stool of cane growing vigorously, notwithstanding absolute neglect, and often living on for years after all its neighbors have died from root disease. The conclusion is irresistible that some, at least, of these stools represent cases of real immunity. So many such cases came under the observation of the writer some years ago while acting as consulting agriculturalist for the Cuban American Sugar Company, and the chances seemed so good for practical results from the selection and propagation of these possibly resistant strains that the appointment was secured of H. B. Cowgill, a graduate in plant-breeding, and he was set to work searching for and propagating all promising material of this kind. At the end of six months several hundred selections had been secured and planted in a nursery for further testing and propagation. A complete change in the policy of the company, however, caused the work to be suddenly abandoned, so that no results whatever were obtained.

Another example of the possibilities in this line of selection is afforded in the cane fields of western Porto Rico that have been so completely invaded by the mosaic disease. There are some fields that are absolutely a hundred per cent infected. In the great majority

of even the worst cases, however, here and there a stalk will be seen that is still healthy. These stand up well above their infected neighbors and are quite conspicuous from their darker green color. Of course such cases are largely accidental; however the possibility exists that some of them may represent real resistance or even immunity. A strain of Rayada or Cristalina having real resistance to this disease would have such great practical value as to amply repay the effort of searching for it. A few of these striking cases have been brought in and are now growing on the Station grounds.<sup>1</sup> The danger, however, of bringing in incipient cases of mosaic disease has been too great to do this work of selection on a large scale here where it is necessary to keep the grounds free from mosaic. The planting of a cooperative immunity experiment on the grounds of the College of Agriculture at Mayagüez seemed to offer an opportunity for this work. Some fifty or sixty healthy canes were therefore selected from heavily diseased fields in the Añasco valley and were brought and planted with this experiment. Continued drouth led to the complete failure of this planting and again the attempt at asexual selection for disease resistance has given no results. This attractive field still remains open for future investigators.

#### THE FLOWERING OF SUGAR CANE

Some varieties of sugar cane flower or "arrow" freely, the fields in the late fall with their waving pampa-like plumes being much more striking than a corn field in tassel. Other kinds seldom or never flower, at least under Porto Rican conditions. Some of the older writers attempted to use this distinction as the basis of a classification dividing cane varieties into two groups, one containing the canes that do not arrow. This grouping is of little practical use, however, since there are many kinds, including such standard widely planted varieties as Cristalina and Rayada, which bloom freely in some years and on certain soils while under other conditions and in other years they completely fail to bloom. Thus in Cuba where Cristalina is grown so extensively it very seldom blooms on the red lands while on the black lands it frequently blooms very freely. Just what the conditions are which induce or inhibit blooming is not well understood. The arrows usually appear in November and December. In Cuba this coincides with the beginning of the dry

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<sup>1</sup> None of these proved particularly resistant to Mosaic eventually.—A. H. R.



season and the opinion prevails that it is induced by the sudden checking of growth due to the lack of moisture. In Porto Rico, however, cane blooms at about the same season, though November and December, at least on the north coast, are usually wet months. The age of the cane is, of course, a factor of importance. As a rule, arrowing does not occur when the cane is less than twelve months old.<sup>1</sup> Spring-planted cane, therefore, arrows much less than fall-planted or *gran cultura* cane. There are some varieties, however, that will arrow with the coming of November even if planted as late as May or June. With the craze of new seedling varieties that has dominated the sugar-cane world during the last twenty years the question of arrowing has taken on new importance since only those canes which flower freely could be used as parents for new varieties. All of these newer kinds are thus descended from free flowering kinds and it is natural that most of them tend to arrow more freely than is usual with the older varieties which have been propagated asexually for a great number of years. It seems necessary, therefore, to note somewhat carefully the tendency to arrow in each of the varieties under study and to determine the effect of arrowing on sugar production and on the general usefulness of the variety. Arrowing, of course, stops the further growth in length of the cane and thus tends to limit tonnage. As it is a sign of maturity is is popularly supposed that arrowing indicates the time of greatest richness in sugar cane and that if left in the field after arrowing it will soon begin to deteriorate and go off in sugar content. As a rule, however, arrowed cane does not die. The arrow breaks off and three or four of the upper buds grow out into new shoots and the old stalk may remain in usable condition for weeks or months. The Insular Station has done considerable chemical work to try and determine just what effect on the sugar content of the juice is produced by the flowering and the subsequent sprouting and growth of the axillary buds. Duplicate samples have been taken at different stages from a number of varieties that showed both arrowed and non-arrowed stalks in the same row. The results of these analyses are given in the following table:

<sup>1</sup> This rule does not apply to the Chinese canes in general.—A. H. R.



Variety	Date	Age	Arrow	Extr.	Brix	Suc.	R. S.	Puri.	Fiber
D 109.....	12-30-20	Rat. 9 mo.....	No	70.0	18.94	16.38	0.91	85.58	10.80
D 109.....	12-30-20	Rat. 9 mo.....	Yes	67.3	20.04	17.85	1.15	89.70	13.08
D 109.....	2-4-21	Pl. 16 mo.....	No	65.2	18.00	16.33	0.59	90.72	11.13
D 109.....	2-4-21	Pl. 16 mo.....	Yes	64.0	17.50	15.34	0.62	87.65	12.24
D 109.....	4-6-21	Pl. 17 mo.....	No	68.7	16.30	13.59	1.26	83.37	12.52
D 109.....	4-6-21	Pl. 17 mo.....	Yes	67.8	19.00	17.09	0.61	89.47	12.35
D 117.....	12-30-20	Rat. 9 mo.....	No	69.13	15.13	12.15	1.69	80.30	11.58
D 117.....	12-30-20	Rat. 9 mo.....	Yes	67.2	16.53	13.66	1.71	82.52	11.80
D 117.....	12-20-20	Rat. 14 mo.....	No	67.6	16.30	13.78	0.72	84.54	10.36
D 117.....	12-20-20	Rat. 14 mo.....	Yes	68.7	17.20	15.03	0.21	87.38	10.60
D 117.....	2-2-21	Rat. 16 mo.....	No	75.0	15.15	12.40	1.36	81.84	11.00
D 117.....	2-2-21	Rat. 16 mo.....	Yes	67.0	18.30	15.82	0.76	86.44	11.22
D 117.....	2-4-21	Pl. 16 mo.....	No	64.7	17.20	14.71	1.50	85.52	12.60
D 117.....	2-4-21	Pl. 16 mo.....	Yes	61.5	17.50	15.20	1.13	86.55	12.32
D 117.....	4-6-21	Pl. 17 mo.....	No	69.2	19.00	17.20	0.77	80.52	12.32
D 117.....	4-6-21	Pl. 17 mo.....	Yes	68.0	19.45	18.02	0.61	82.64	12.80
Uba.....	2-2-21	Pl. 16 mo.....	No	63.8	15.50	13.16	0.95	84.80	13.08
Uba.....	2-2-21	Pl. 16 mo.....	Yes	61.1	17.80	15.83	0.40	88.93	14.00
Uba.....	2-23-21	Rat. 16 mo.....	No	68.5	17.50	15.93	0.39	90.83	13.86
Uba.....	2-23-21	Rat. 16 mo.....	Yes	64.1	17.90	16.26	0.43	90.83	14.36
Uba.....	4-1-21	Pl. 17 mo.....	No	64.8	18.30	15.53	1.06	84.86	12.67
Uba.....	4-1-21	Pl. 17 mo.....	Yes	63.5	18.40	15.89	1.01	86.35	13.00
P. R. 260.....	12-22-20	Rat. 14 mo.....	No	70.8	14.33	10.67	2.03	74.04	9.34
P. R. 260.....	12-22-20	Rat. 14 mo.....	Yes	65.8	16.80	14.00	1.01	83.33	13.08
P. R. 260.....	1-28-21	Rat. 15 mo.....	No	69.2	15.40	12.45	1.47	80.84	12.44
P. R. 260.....	1-28-21	Rat. 15 mo.....	Yes	65.0	17.00	14.81	0.61	87.11	14.00
P. R. 260.....	2-28-21	Pl. 17 mo.....	No	64.2	17.85	15.90	0.62	89.07	12.88
P. R. 260.....	2-28-21	Pl. 17 mo.....	Yes	65.1	17.95	15.78	0.75	87.47	13.96
P. R. 260.....	3-30-21	Rat. 14 mo.....	No	70.8	18.00	15.97	0.55	88.72	12.84
P. R. 260.....	3-30-21	Rat. 14 mo.....	Yes	70.2	18.05	16.09	0.30	89.14	11.92
P. R. 292.....	12-30-20	Rat. 15 mo.....	No	70.0	15.73	13.80	0.87	87.59	10.80
P. R. 292.....	12-30-20	Rat. 15 mo.....	Yes	68.5	17.53	15.59	0.65	88.93	12.60
P. R. 292.....	12-7-21	Pl. 16 mo.....	No	66.6	18.50	16.80	0.65	90.81	12.02
P. R. 292.....	12-7-21	Pl. 16 mo.....	Yes	61.9	18.20	16.45	0.56	90.38	12.95
P. R. 292.....	12-28-21	Pl. 17 mo.....	No	69.4	19.60	18.11	0.41	92.39	12.24
P. R. 292.....	12-28-21	Pl. 17 mo.....	Yes	67.9	19.25	17.28	0.49	89.76	12.84
P. R. 292.....	3-30-21	Rat. 14 mo.....	No	70.5	17.75	16.05	0.33	90.42	12.98
P. R. 292.....	3-30-21	Rat. 14 mo.....	Yes	71.4	18.50	16.80	0.33	90.81	11.44
Average above 19 lots non arrowed.....				68.83	17.05	14.78	0.95	86.15	11.95
Average above 19 lots arrowed.....				66.11	18.05	15.05	0.692	88.19	12.63

These figures show that, taking the average for the season, the arrowed cane gives about 1 per cent more sucrose and 2 per cent better purity than the non-arrowed and that the percentage of reducing sugars is appreciably less. On the other hand, fiber averages a little higher and extraction, at least by the small laboratory mill, is about 2 per cent less. An inspection of the detailed figures shows that these differences are more marked early in the season than they are later when the cane reaches better maturity. Close watch has been kept to detect the point at which the supposed deterioration of the arrowed cane should begin. No evidence has been found to show that such deterioration is a necessary or even an usual effect of arrowing. Arrowing is, of course an indication of maturity. Fully matured cane has less vegetative vigor with which to resist the entrance of *Melanconium* and other rot organism, and the breaking off of the arrow affords and easy opening for their entrance. It is doubtless true that a larger proportion of arrowed than of non-arrowed cane is lost from rot when the cane stands too long in the

field, and it is this that has doubtless led to the idea that arrowing is followed by deterioration.

We may conclude, then, that arrowing is not desirable in late varieties, nor in fields that are to be held for cutting at the last of the crop since it checks growth too early, thus limiting tonnage and it may lead to losses from rotten cane. On the other hand free arrowing may be a distinct advantage in an early cane that is to be cut during the first part of the crop, since, as seen by the foregoing analyses it may frequently at that season give as much as 2 per cent more sucrose while the loss of growth and tonnage would then be negligible.<sup>1</sup>

#### THE RIPENING OF CANE

It has already been stated that the richness or sugar content of cane depends more on the state of maturity than it does on variety. A well-grown, fully ripened cane of the poorest variety will contain more sugar than a green, immature cane of the richest kind. Different varieties ripen very unevenly, some maturing early and others late. This shows the inadvisability of mixing them together in the same planting. After full maturity is reached cane begins to deteriorate. Cases of top rot often appear and joints injured by borers or by other causes may begin to rot. If a second growth sets in, a portion of the crystallizable sucrose will revert to glucose. All of these causes tend to lower the sucrose content and purity of cane that has become over ripe. The length of time after maturity before deterioration sets in varies with different varieties and with weather conditions. Thus Otaheite goes to pieces quickly. It must be cut as soon as it is fully matured in order to avoid heavy losses. Cristalina, on the other hand, usually remains long in good condition. If the weather remains dry it will stand in the field for weeks or even months with no loss of sucrose or purity. Heavy rains during the grinding season always result in losses of sucrose since they not only start the cane into new growth but tend to also favor growth of rot-causing organisms. Here again the question of the variety is of great importance since some start new growth with germination of the side buds much more easily than others.

The ripening of cane depends on a number of factors. The nature of the variety is one of the most important since some kinds are mature enough at ten months, with other conditions favorable, to give a very satisfactory yield, while under the same conditions other kinds

<sup>1</sup> It is very likely, however, that the flowered stalks are simply the oldest in the stool.—  
A. H. R.

will not be at their best under fifteen or eighteen months. The amount and distribution of rainfall or of irrigation is the one most important factor. The highest sugar content is never reached until vegetative growth has entirely stopped. This does not happen as long as the soil is abundantly supplied with moisture. The highest sugar yields are found always in countries with a pronounced dry season during grinding. In countries with continuous rainfall the cane never becomes fully ripe. For this reason in irrigated countries it is the custom to withhold the water for a time previous to the cutting in order to ripen the cane. Temperature is another factor. Cool weather promotes the ripening, while heat induces growth. Soil conditions, too, have a considerable influence on ripening. On porous, well-drained lands cane ripens earlier than in low, moist, retentive soils. As a rule, hill lands are earlier than low lands. The chemical composition of soils and of the fertilizers used also have a marked effect on maturity. Abundance of nitrogen and probably also of potash tends to prolong the season of active growth and hence delay the ripening. Fosforic acid, on the other hand, has some tendency to promote early maturity. The first crops of cane on virgin timber land are notoriously low in sucrose content. After three or four cuttings the cane becomes much sweeter. This is mainly because the over-supply of nitrogen on new land unduly stimulates vegetative growth and prevents ripening. All of these factors should be carefully considered in selecting varieties for these different classes of lands. It is an evident mistake to plant such vigorous, low-sucrose, late-maturers as Yellow Caledonia, Cavangerie or B 3412 on rich, new lands where it is certain that they will not mature sufficiently to be worth grinding. It is equally a mistake to plant high-sucrose canes like B 208 in poor, dry soils where it can not possibly be expected to yield a profitable tonnage. Again, in the selection and use of fertilizers it may be profitable to force high-sucrose kinds like the Rayada or Cristalina with heavy applications of fertilizers high in nitrogen, while for the lower sucrose canes like the Yellow Caledonia less nitrogen and more fosforic acid are clearly indicated.

Cultural methods, too, may have some effect on maturity. In some countries the trashing of the cane by stripping off the dead adhering leaves is widely practiced with the view of letting in more light and air and thus hastening maturity. Under Porto Rican conditions this does not seem to be profitable. The operation of tillage are all calculated to increase the vegetative growth of the cane, but after

the cane closes these are discontinued and so do not interfere with normal ripening.

The approach of maturity or ripeness is indicated in several ways. Usually there is a noticeable change in the color of the stalk. Green canes tend to turn yellow and red or purple canes become duller in color or some of them turn brownish or olive. The leaves, too, become pale and in many kinds there is more of a tendency to droop and to be less erect than when the cane is in active growth. Arrowing is, of course, a sign of maturity. Canes with the arrow in full flower quite uniformly show one to two per cent more sucrose than those in the same row that have not arrowed. It is a mistake, however, to assume, as is done by some writers, that flowering marks the time of greatest sucrose content. This is far from being the case as shown conclusively by the figures given on another page. The fact that a field has flowered freely can not be taken as evidence that it is necessarily ready for cutting. Judging just when a field of cane is in the best condition for cutting is a matter requiring much practical experience. It is also a place where practical men are often at fault. Many a fine field of vigorous, heavy-tonnage cane is sacrificed by cutting it too early when by leaving it a few weeks longer the gain in sucrose would have been great. The present system of buying cane from the *colonos* on a tonnage basis constantly tends to the grinding of immature cane with a corresponding heavy loss in sugar yields. While the trained eye of the field man can judge fairly well in most cases as to the ripeness of the cane the final judgment must be given by the chemist. Preliminary hand-mill analyses should always be made when there is any doubt as to the ripeness of a given cane. This should particularly be the case with the newer and less well-known kinds. Each per cent of additional sucrose in the cane of a forty-ton crop means 400 pounds more sugar per acre in the bags.

#### THE DETERIORATION OF CANE

It has been noted under the last heading that after reaching full maturity cane becomes over ripe and begins to deteriorate in the field. The rate and extent of this deterioration depends very largely on weather conditions, being much less in periods of continued dry, cool weather, and greatest when heavy rains follow a period of prolonged drouth. In cold climates where frost occurs this greatly accelerates deterioration. In such climates it is often necessary to cut and windrow the cane so that it may be protected from freezing. The amount of deterioration, too, will depend largely on the abun-



dance of borers, white grubs or other insect pests that may injure the cane and on the presence or absence of the various organisms connected with root disease and top rot. An extreme case of rapid deterioration and heavy loss from these combined causes is detailed in this JOURNAL, Vol. 4 (1): pp. 16-26, under a discussion of Root Disease. The same citation serves, however, to also demonstrate the great importance of the influence of the variety in a discussion of this question. Of the 171 varieties reported on in this experiment eight showed no appreciable loss when harvested, three were a complete loss, all having died from top rot and rind disease, while the others showed all possible variations between these extremes. Since no analyses were made the notes taken could only consider the evident and complete loss caused by the death of the cane. Had it been possible to make a series of analyses of these plots the results would have been very interesting in showing to what extent the canes which did not die of the different varieties were actually deteriorating and going off in sugar content. With the immense amount of work that has been given to sugar-cane analyses in different parts of the world it is really remarkable that so few cases are recorded where the chemical condition of the cane in the same plot has been followed throughout the season and has been, properly correlated with growth and weather conditions. The interesting work done at this Station with Yellow Caledonia cane (see paper by the Director, E. D. Colón, Ins. Exp. St., Circ. 33) needs to be repeated with each variety under cultivation, not once but several times under different conditions, before we will be able to fully judge of their desirability for different planting purposes.

After cutting, cane deteriorates much more rapidly than when still standing in the field. The amount and rate of loss varies widely according to weather conditions. In Louisiana, with the thermometer near the freezing point, windrowed cane will keep for several weeks with very little loss from deterioration. On the other hand, with hot weather in the tropics serious losses may occur within three days after cutting. Too little attention is usually given to this most important subject. With the loose harvesting methods prevailing, both in Porto Rico and Cuba, where a week or more often elapses between cutting and grinding, it is certain that enormous losses are annually taking place. No reform is more urgently needed than that of so organizing the work that no cane lies more than two or three days after cutting before grinding. Losses from this source are needless except in cases of accident, and simply result from lack of system and organization. On the other hand, during the first twenty-four



or twenty-eight hours after cutting, cane often shows an apparent gain in sucrose due to the evaporation of moisture. In India this is sometimes taken advantage of by leaving the cane in the sun for a day without topping, the transpiration from the leaves resulting in a considerable concentration of the juice before grinding.

Little attention seems to have been given to the comparative keeping qualities of different varieties of cane. There can be no question, however, that some will deteriorate after cutting much more rapidly than others. It is a question of great practical importance, especially while present loose-harvesting methods prevail. It could be easily investigated if sufficient chemical assistance was available by making daily analyses from the same piles of cut canes.<sup>(1)</sup>

Cane that has been burned before cutting deteriorates much more rapidly than that which has not been burned. Accidental cane-field fires frequently occur and burning in advance of cutting is often resorted to as an aid in harvesting. If rain occurs deterioration is much more rapid than when it continues dry. In Cuba the rule at most mills is to receive burned cane up to five days after the fire if the weather is dry, but if a heavy rain falls no more will be accepted. This limit results in the grinding of much badly deteriorated cane, often almost drowning the factory in molasses, but it is extended as much as possible as an aid to the *colono* who has been unfortunate enough to have an accidental fire. When for any reason cane is purposely fired before cutting, arrangements should be such that it can be rushed to the mill and ground during the first forty-eight hours.<sup>2</sup> If this can be done no loss of sugar will occur, but the burning of the field may result in loss to the following ratoon crops. The practice can only be recommended in exceptional cases, as when a field is going to be immediately plowed up. There is no data as to whether different varieties have different keeping qualities after burning. Probably such differences, if any, would be slight since the burning kills the cane and thus to a great extent destroys the individuality of the variety.

#### LONG RATOONING

Closely connected with the keeping quality of cane in the field is the question of long ratooning. In Hawaii the custom widely prevails of letting the ratoons from late spring harvesting go over

<sup>1</sup> Much work along this line has been done in Argentina at the Tucumán Experiment Station.—A. H. R.

<sup>2</sup> This is commonly practiced in Peru, where burning is almost universal.—A. H. R.

till the beginning of the second succeeding harvest, thus allowing twenty to twenty-two months' growth. These are known as "long ratoons". Fields cut early in the crop are cut again toward the last of the first following harvest when from fourteen to sixteen months old. These are known as "short ratoons". In like manner early-plant cane corresponding to our *gran cultura*, is cut during the following crop when fifteen to eighteen months old but spring plant is held over to the second year and is not cut under twenty months. The enormous yields of sugar per acre so often reported from Hawaii with Yellow Caledonia cane have all come from these old canes. They really represent two seasons' growth rather than one. Whether it is better and more economical to thus cut one big crop every two years or at best two such crops in three years rather than a smaller crop cut every year is a question that must be decided in each locality according to local conditions.<sup>1</sup> In Cuba ratoons are seldom allowed to go over to the second year, though this sometimes happens when rain sets in early and prevents the normal closing of the crop season. Late spring-planted cane, however, is frequently held over and is cut as *caña quedada* at the beginning or the second following crop. Many planters hold that this gives more economical results than cutting it and allowing it to ratoon, for though the total tonnage secured will be less the expenses of cultivation will also be materially less, resulting in a cheaper average cost per ton of cane. The gain will largely depend on weather conditions. In winters of severe drouth the cane becomes so weakened that much of it dies if left standing and the expected increase in yield is not realized. In such seasons it is considered best to cut all of the spring cane, even, if the tonnage is very small, rather than to let it go over. On the irrigated lands of Hawaii this difficulty in making a long crop is not encountered, but with some varieties it is found necessary to cut off the young cane after it has made two or three months' growth and force a second ratooning in order to avoid premature arrowing during the first of November, since arrowed cane can not be held over profitably. It makes aerial suckers instead of the continued growth of the stalk. Here in Porto Rico cane is very seldom allowed to go over for a long crop. In fact a large part of the Porto Rican crop is made each year from cane that is less than twelve months old. This probably accounts in great measure for the smaller average *rendimiento* or yield in sugar per ton of cane ground that is secured here as compared with Cuba and Hawaii. This custom has probably

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<sup>1</sup> Mr. López Domínguez and the writer are now trying out this system for Porto Rico.—  
A. H. R.

come from the long-continued planting of the Otaheite cane. This variety remained in general cultivation much longer here than in Cuba. It deteriorates faster after reaching maturity than any of the other kinds that are usually cultivated, thus forcing the short-crop system. That nothing in the local conditions prevents the successful holding over here of late spring plantings of *Cristalina* and some of the newer seedling canes is shown by some of the preliminary experiments carried out at this Station. In the small plots under observation damage from rats has been heavy, but otherwise the cane has come through in good condition. The comparatively frequent winter showers makes it easier to hold over cane here than in Cuba. In how far it will be more profitable to hold over late spring-planted cane rather than to cut it green during the first crop is a question that deserves the careful attention of plantation managers.<sup>1</sup> It will assume more importance in the future with the system of "buying by *dulce*"—that is, on the sucrose content of the cane—rather than by its gross weight, that is being adopted by some of the centrals. Some varieties will adapt themselves to a system of long cropping very much better than others, but unfortunately our knowledge on this point is limited. In a general way, the non-flowering canes will be better for this purpose than those that arrow freely, and those with strong resistance to root disease and top rot will be better than the more susceptible kinds. Here, again, it is vigor and power of resistance that will count rather than high sucrose content. These are the features that have adapted the Yellow Caledonia so well to the long cropping methods in Hawaii. The question should be carefully studied whether or not this is also the best method of handling this variety in Porto Rico.

#### THE BOTANY OF SUGAR-CANE VARIETIES

The true sugar canes all belong to the genus *Saccharum*, founded by Linnaeus in the first edition of the "*Species Plantarum*," published in 1753. He then included two species *S. officinarum* and *S. Spicatum*. The latter was not a true sugar cane and is excluded from the genus by recent authors. The number of supposed species increased rapidly. Thus Willdenow, in the third edition of the "*Species Plantarum*" in 1797, lists eleven species and Kunth, in 1833 in the "*Enumeratio Plantarum*," lists 22 species besides various varieties. Roxburg, in his "*Flora of India*," 1832, gives eleven

<sup>1</sup> Mr. W. C. Dreier has many times demonstrated the feasibility of this system at the Hatillo Fruit Farm.—A. E. P.

species for that country alone, eight of them being described as new. Hooker, in the "Flora of British India," 1897 reduces the number to five. Bentham and Hooker, in "Genera Plantarum," 1883, recognize only 12 species for the world. Hackel, in his monumental revision of the grasses in Engler & Prantl, "Pflanzen familien," 1887, also recognizes 12 species, divided into four section or sub-genera, but only two, *S. officinarum* and *S. spontaneum*, belong in section *Eu-Saccharum*, or the true sugar canes. Of these *S. Spontaneum* occurs abundantly in the wild state in India and other parts of Southern Asia and in many of the Pacific Islands. According to C. A. Barber (Punjab Canes, Mem. Dept. Agr., India (1) 1919), who has studied the wild forms carefully and used them for crossing on cultivated kinds, this is an exceedingly variable species. The diameter of the stalk varies from no larger than a straw to as much as 2 centimeters or more; the color may be red or yellow, the leaves very narrow or comparatively broad, the leaf sheaths smooth or prickly, and finally the buds may vary through most of the forms found in cultivated varieties. The evidence is conclusive that the slender cultivated kinds of Northern India (including Uba which attracted so much attention in Porto Rico because of this immunity, to mosaic disease) are nothing more than selected forms of this wild species. *S. officinarum* was founded by Linnaeus on the cultivated thick-stemmed tropical sugar canes. It has always been held that these constitutes a distinct species, but no wild representative of it has ever been found. It is distinguished from the forms of *S. spontaneum* by the usually thicker stalks and wider leaves and by the glabrous rachis and peduncle of the flowering panicle. The varieties belonging to the former species all have these parts densely hirsute. In size of stalk and leaf, however, the two series clearly tend to merge into each other. B-1753 and B-3412, for example, are only a little stouter and the leaves are not much broader than in vigorously grown Uba, and now the only really technical distinction between the supposed species gives way, for a number of the newer seedling canes have the peduncle and rachis clearly hirsute. This is notably so with P.R.-292, a seedling of D-117, and to a less degree with P.R.-260 of unknown parentage. Those of Kobus' Chunnee X Cheribon hybrids that have been examined, notably 36-P.O.J. and 105-P.O.J., have these parts as densely hirsute as the Uba. This might be held to show that other seedlings showing this character are also of hybrid origin. We have no evidence, however, that varieties of Indian origin existed in the Barbados and Demerara collections, from which most of our recent seedlings have sprung. The



more likely supposition would seem to be that this hairiness of peduncle and rachis represents a reversion to some remote ancestral type. This would go to substantiate the idea clearly indicated by Barber, even if not openly advocated, that all cultivated sugar canes, both thick-stalked and thin-stalked kinds, are in reality descendants of the wild *Saccharum spontaneum*.

In order to describe sugar-cane varieties so that they may be recognized by others it is necessary to employ the methods and to a considerable extent the terminology used in ordinary descriptive botany or taxonomy. This was attempted in the first paper of this series (Journ. 3 (2) 1919) but with only partial success. When that paper was written the work of C. A. Barber in India and Dr. J. Jeswiet in Java had not been seen. These two writers have laid a broad and secure foundation for the study of sugar-cane taxonomy. For the first time we have descriptions of cane varieties that are sufficiently full to permit of sure identification. It is unfortunate that their studies have not included a much greater range of varieties. Their methods, while essentially similar, having originated independently, are naturally not identical. Of the two, that of Barber seems preferable since it more nearly conforms to ordinary botanical usage. Jeswiet's method of dividing the parts of the bud and other regions of the plant body into serially numbered areas for purposes of description, especially for noting the presence or absence of plant hairs, seems to introduce an unnecessary complication. In this, however, he is followed by G. L. Fawcett of the Argentine Sugar Station, who has also recently published some most useful cane descriptions. The author must be permitted to express a doubt as to the usefulness of the detailed measurements of length and diameter of different parts since these factors are so greatly altered by conditions of growth and environment.

A cane description should cover notes on all of the following points:

1st. General habit; whether erect or soon prostrate, heavy or light stooling habit, general vigor, and propensity to arrow.

2nd. The stalk as a whole; average diameter, color and bloom. Canes under 3 centimeters in average diameter are characterized as slender; those about 3 centimeters medium slender; 3 to 3½ centimeters as medium; 3½ to 4 centimeters as medium stout; and above 4 centimeters as stout or very stout. Of course such measurements refer to the average for ordinary well-grown canes, not to old, half-starved ratoons nor to overgrown suckers. Color of stalk is one of the most obvious characters, but it can be one of the most misleading,



since in many varieties color is dependent on growth, vigor and exposure to light. This is particularly true of that large number of varieties which are normally green but which show a more or less pronounced pinkish or reddish flush when exposed to light and air. In the descriptions the color refers to that of fully matured internodes that have been exposed by the falling of the leaves but which have not yet become faded or discolored. The changes in color which accompany ripening have already been mentioned, as well as the striking color changes often brought about by sporting or bud variation. Changes in location and soil often lead to marked color changes. The amount of the waxy coating or bloom should always be carefully noted, though this, too, is a character somewhat dependent on growth conditions.

3rd. *The character of the internode.*—Here should be noted comparative length, though this can only be stated in general terms, being largely dependent on growth conditions and often varying widely in different parts of the same stalk; general form, whether cylindrical or compressed or barrel-shaped, and whether it is enlarged either above or below; finally, whether or not it has a groove or furrow on the side above the bud, and if present something regarding its character.

4th. *The nodes.*—Whether constricted, even, or prominently enlarged; and whether at right angles to the stalk or oblique. The node consists of several elements. Under it should be noted—

(a) *The growth ring.*—This is a narrow region separating the node from the internode above. It may differ from the internode in color or be concolorous and it may be sunken, even, or elevated. The width is also quite variable. The cellular tissue of this region remains in a plastic growing condition much longer than the rest of the stalk, and by the division and growth of the cells on the lower side it enables the younger growing part of the cane to again assume an erect position when it has been thrown down by storms or prostrated by its own weight. In the first paper this was referred to as the "limiting ring" since it marks the limit between the node and internode, but for the sake of uniformity it seems best to adopt Barber's very appropriate name which refers, of course, to this continued power of growth of the cells in this region.

(b) *The root band.*—This name is applied to the space between the growth ring and the point of attachment of the leaf sheath. In different varieties it varies from about 6 to as much as 12 millimeters in width. It is usually of a somewhat different shade of color from the internode and is marked by irregular encircling rows

of rounded dots which mark the ends of rudimentary roots. These quickly grow out and form a root system when cuttings are planted in moist soil. In some varieties, especially if the weather is wet, they spring into growth prematurely on the standing cane. The number of rows and the color, size and prominence of the rudimentary roots should be noted.

(c) *The leaf scar*.—This is a remnant of the base of the leaf sheath which remains on the stalk when the leaf falls away. It is usually prominent or squarrose under the bud and may be so on all sides, but it more often closely appressed to the stalk behind on the side away from the bud. In very young joints of cane there is usually a conspicuous circlet of long hair on the base of the leaf sheath. They are usually deciduous, falling away before the maturity of the leaf and thus leaving the leaf scar glabrous. In a few varieties, however, they are persistent, leaving the leaf scar conspicuously ciliated. This is usually a constant character of considerable importance.

(d) *The glaucous band*.—This name is applied to a region usually about a centimeter wide immediately below the leaf scar which is characterized by a heavy deposit of wax even in those varieties in which otherwise this material is scanty or wanting. In fact, it is in the kinds with little bloom that the glaucous band is most conspicuous since it is more or less obscured by a general waxy coating or bloom. This band is often though not always conspicuously sunken or constricted. It is sometimes this and sometimes the root band that constitute the narrowest part of the stalk. In some cases, however, particularly with some of the North Indian canes, these parts are conspicuously swollen, being of a considerably greater diameter than the internodes.

5th. *The buds*.—These give us characters of greater taxonomic importance than any other part of the cane. Bud characters are less variable and less dependent on growth conditions than any of the others, and it is on their careful description that we must mainly depend for recognizing varieties. If this had been thoroughly understood by the older writers on cane varieties it would have prevented much of the unfortunate confusion found in the literature of this subject. Although affording the most stable characters of any part of the cane plant, the appearance of the bud varies greatly at different ages and stages of development and some judgement and experience is required to determine whether or not a given stalk shows buds that are in a typical condition. Unless otherwise stated, bud descriptions should apply to those that are fully grown and

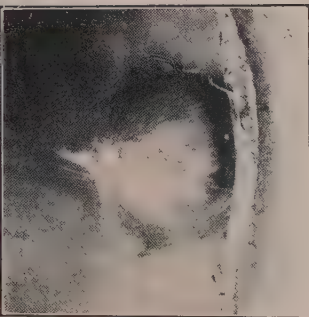


FIG. 2  
A BUD OF B-208 SHOWING  
MARGIN WITH LARGE LOBES  
AND BARBED APEX.  
X ABOUT 3

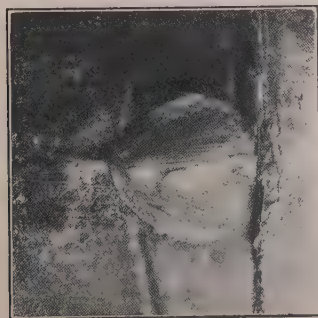


FIG. 1  
A BUD OF YELLOW CALEDONIA  
SHOWING A NARROW UNIFORM  
MARGIN WITHOUT LOBES AND  
A BARBED APEX.  
X ABOUT 3



FIG. 3  
A BUD OF THE SAME  
VARIETY, EXPANDED,  
SHOWING THE GLO-  
BOID POINT.  
X ABOUT 3



FIG. 4  
THE CILIATED LEAF-SCAR, OCCURRING  
ON B-3747; B-1355 AND B-1356.  
X ABOUT 3½



developed but which have not started to germinate on the standing stalk. With some varieties this happens very promptly after the bud is mature and it is often difficult to find buds that are in a condition to be really typical. After arrowing it is usually difficult to find buds that are in good condition. As a rule cane that is about ten months old is in the best condition for study.

Under the buds should be noted the general form, whether lance-



FIG. 1.—Well marked, constricted glaucous bands of B-4596

olate, ovate, oval, suborbicular or broader than long; the apex, whether acute or obtusely rounded; the flat sterile margin, whether narrow and uniform in width, broad and uniform or shouldered, that is abruptly widened below; the point of germination, whether apical, subapical, subdorsal or dorsal, so called when the germinating point issues near the center of the bud and not at or near its apex; the average size should be given, especially in relation to the other ele-



ments of the node. In some cases the buds do not reach to the growth ring, while in other varieties they may exceed it by as much as



FIG. 2.—Elliptic ovate bud of Otaheite



FIG. 3.—Ovate bud of D-117

half of their length; finally the presence or absence of hairs should be noted, especially at the base, on the sides, and at the apex. In a few kinds the entire back of the bud may be hairy. This character

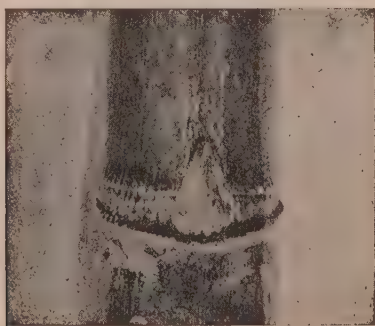


FIG. 4.—Bud exceeding growth ring by one-half its length

is often obscured in buds where mealy-bugs have been feeding. Such buds should not be selected for study.

6th. *The leaf sheath*.—In many varieties the leaf sheaths have a dense vestiture or coating of sharp, stiff hairs over the greater part of their surface. This was often referred to as “cane itch” by the older writers, since these sharp hairs prick and irritate the skin of persons handling the cane. This vestiture may be persistent or it may be more or less deciduous, appearing only on the younger sheaths and falling off at maturity. Its general character and abundance and the color of the hairs should be noted. In many other varieties this vestiture is reduced to a few scattered hairs along the median line on the back of the sheath or it may be entirely absent. Such sheaths are called “glabrous”, or if only a very little hair is present “glabrate”. If much wax appears on the sheath it is called “glaucous”. The color is usually green but it may be tinted with red or purple and in some varieties it is quite dark purple. In connection with the sheath should be noted—

(a) *The throat*.—This is a discolored, usually more or less crumpled or wrinkled area in the axil of the leaf where the blade joins the sheath. It is usually lannate, that is, coated with numerous short appressed, wool-like, more or less felted hairs, but it may be only waxy or glaucous. Usually also there are conspicuous tufts of long hairs. All these characters should be noted.

(b) *The collar*.—This is the corresponding region on the outside of the leaf. It consists of two or more clearly marked triangular discolored areas which may or may not meet and coalesce at the midrib. The surface may be lannate or only glaucous.

(c) *The ligule*.—This is a short, circular, brown, somewhat horny membrane that clasps the stalk at the base of the leaf blade. It varies somewhat in length and shape in different kinds and the edge may be nearly even or conspicuously fimbriate or fringed.

(d) *The ligular process*.—This name is applied by Barber to the coriaceous triangular outgrowths or lobes seen in some varieties at the upper corners or shoulders of the leaf sheaths. These may be large or small, broad and obtuse or slender and acute. They may be present on one shoulder only or on both, or they may be entirely absent.

7th. *The leaf, or more properly, the leaf blade*. The general position should be noted, whether spreading, erect with the tips declined or strictly erect. The color may be light green or yellowish green, dark green, or glaucous or bluish green. Measurements of the average width should be given. Finally, the character of the serrations on the margin should be noted as well as the presence or absence of long straggling hairs or cilia on the margins near the base.

8th. A full description should include the characters of the arrow or inflorescence, since this is likely to afford many points of value. The arrows are only in condition for study for a brief period and in many varieties they are seldom or never produced. For practical purposes, therefore, it seems best to largely ignore the characters afforded by them. A tendency to free arrowing or the reverse should, however, always be noted.

#### THE SUGAR-CANE SOILS OF PORTO RICO

In judging of the agricultural value of the different varieties, it is frequently necessary to refer to the different soil types to which they are adapted. To do this intelligently it is necessary to consider briefly the different kinds of soil on which cane is grown in Porto Rico.

Unfortunately, existing knowledge is very limited regarding Porto Rican soils and their classification. No comprehensive study of the soils of the Island ever seems to have been undertaken. Some years ago the Division of Soils of the United States Department of Agriculture made some preliminary studies in cooperation with the Mayagüez Station and a report was published with a soil map in colors covering north-and-south section of the Island from Arecibo to Ponce. This covers at least two important cane-growing districts and should have been of basic importance for the present purpose. Unfortunately, like so much of the work of this Division, it is largely lacking in practical value. The classification seems to have been based on the mechanical analyses of the surface soils with scant attention to geological derivation and subsoil conditions, both points having a profound bearing on drainage and general cultural adaptabilities. It is disturbing to find the same name applied to soils in the coastal plain near Arecibo and to those many miles among the hills of the interior.

The following tentative classification of the cane lands of the Island is based on their most obvious geological and agricultural characteristics and makes no claims to being anything more than an aid in the discussion of varietal adaptabilities. The first five numbers are the more recent geologically, belonging to the mangrove swamp and coral-reef formations, while the last three belong to the older central mountain mass of the Island.

1st. *Maritime Soils*.—These were originally deposits formed at the bottom of salt-water lagoons and estuaries. Each barrier reef cuts off a lagoon of quiet water which gradually fills up with sedimentary

deposits. Finally it usually grows up to mangroves, and at last by the continued accumulation of sediments and fallen leaves it is built up above the ordinary tides and becomes usable land, or it may be elevated by oscillations in the shore level. Much of the best cane land in Porto Rico is of this origin. Practically all of the sugar of Demerara is grown on such lands. They are usually stiff and intractable and difficult to work. Being of an impermeable nature, lying so flat and low, drainage is a first requisite, and good drainage is often difficult to secure on account of the impossibility of finding a sufficient outlet. These lands are very rich, but when long in cultivation they become very compact, and without careful cultivation cane, and particularly ratoon cane, suffers from root disease caused by lack of drainage and aeration. Most of these lands still retain a certain amount of salt, and in many places, especially on the dry south coast, they are too salty to permit of cane growing. They are roughly divided by planters into *payals*, *semi-payals* and *vegas*, in accordance with their elevation above sea level. The *payals* are really marshes. They are only slightly above sea level and standing water can always be found in the drainage ditches: as a rule, cultivation must all be done with the hoe. The *vegas* are sufficiently elevated to be above standing water. They may be prepared and cultivated like ordinary uplands, but these operations are impeded by the necessity for numerous drainage ditches. As the name indicates, the *semi-payals* are intermediate between the other two.

2nd. *Alluvial Soils*.—These are the deposits formed by running water. They always form the bottom lands along streams, and in Porto Rico, especially on the south coast, these deposits spread out and cover a considerable portion of the coastal plain. These soils are usually lighter in texture and much easier to work than the maritime soils, and as they are often built up from alternating deposits of silt, sand and gravel they are not so retentive and are easier to drain. The very best sugar lands of the Island are of this type. These lands are also called *vegas* in Porto Rico, which is unfortunate since their cultural requirements are quite different from the *vegas* discussed under the last heading.

When alluvial deposits have all come down from red shale clay hills (described under No. 6), as happens at both the eastern and western ends of the Island, in the Fajardo and Mayagüez Añasco districts, the resulting soil, being unmixed with sand as in ordinary alluviums, is as heavy and compact as on the hills from which it came, and from its retentiveness it also presents a difficult drainage

problem. These clay alluviums are not so rich as the maritime *vegas* and they are equally difficult to cultivate.

3rd. *Dune Sands*.—Along the north and east coasts there are considerable areas where the soil is more or less mixed with wind-blown sands. These are really cocoanut and not cane soils, but considerable areas of cane are found planted on them. They vary in consistency from the almost pure sand of an actual dune to sandy loams where there is a considerable admixture of the red soil discussed in the next paragraph. As cane soils they are of but little importance and no attention has so far been given to selecting varieties particularly adapted to them.

4th. *The Coral Red Lands*.—This is an exceedingly important soil area occupying the valleys between the coral limestone hills all the way from San Juan to Aguadilla and extending back into the interior almost to Utuado and Lares. This soil is red in color. Under forest conditions there may be a shallow surface of black mould, but this soon disappears under cultivation. It seems to be the residue left from the weathering of the coral rock and the dissolving out of the carbonate of lime. In texture it is a fine silt, more or less admixed with sand. There is no subsoil, but the deposit goes down unchanged to the coral bed rock whether it be only 6 inches or 60 feet. It is sufficiently open and permeable for the rainfall to pass through it readily so that drainage ditches are not required. Crops are seldom or never injured by too much rain on these soils, but they often suffer seriously from drouth. When first cleared these lands are sufficiently fertile, but on account of their porous nature they leach and become exhausted much quicker than more retentive soils. The famous red-cane lands of Cuba and also those of Barbados are of this same general nature, though the Porto Rican red lands have rather more of an admixture of sand than those of Cuba.

5th. *The Black Calcareous Soils*.—These also belong geologically with the coastal coral deposit, but they seem to represent an earlier formation than the red lands and they are quite different agriculturally. They consist of a black loam that is usually rather shallow and which is underlaid by a soft white deposit of carbonate of lime. The area of these lands is not large in Porto Rico. They have been noted near Bayaney on the north side of the Island and on the lower foot hills near Yauco and Ponce on the south side. In Cuba lands of this general character occupy very extensive areas in Havana,



Matanzas and Santa Clara Provinces. Next to the "red lands" they comprise the most important cane soils of the Island.

The above five groups comprise all of the cane soils derived from the more recent formations of the coastal region. The following three are the only areas of consequence, planted to cane, derived from the central mountains mass of the Island.

6th. *The Red Shale Clay*.—These soils occupy extensive areas in the foothills, especially on the northern side of the central mountain mass of the Island. They may be found all the way from Fajardo to Mayagüez. In color they closely resemble the coral red lands discussed under No. 4, but they are very different in cultural characters, being tough and impermeable while the former are open and porous. Although difficult to properly prepare and cultivate, they are naturally strong soils and give good yields when properly handled. Large areas of them are planted in cane. The yields secured are usually small, but they could easily be greatly improved by the proper selection of varieties and by better tillage. Like the stiff maritime coast lands, they require frequent cultivations to prevent them from becoming too compact for plant growth. The old methods of hoe cultivation do not give good results on these soils, especially after the humus is exhausted by constant cropping. Green manuring with legumes and better tillage will work wonders on these lands. The application of lime or ground limestone is also very beneficial to them, although it would be worse than useless on the black lands discussed under No. 5.

7th. *Sandy Loam Hill Lands*.—These are really tobacco rather than cane lands, but considerable areas of them are planted in cane, especially between Juncos and Humacao and in the Cayey district. They seem to have been derived either from decomposed granite or from the so-called volcanic ash that constitute the bed rock in some part of the central mountain region. They are of minor importance to the cane industry.

8th. *Black Hill Lands*.—At other parts in the hill lands are found rather heavy black soils with a yellow clay subsoil. These are usually marked by scattered masses and boulders of a hard blackish rock, the nature of which has not been determined. Considerable areas of these lands are planted in cane, particularly in the districts about Juncos and Trujillo Alto. They are among the best of the hill lands for cane.

#### HISTORY OF SUGAR-CANE VARIETIES IN PORTO RICO

Sugar cane was taken by Columbus to Santo Domingo on his

second voyage in 1493, but this shipment was lost. Cane seems to have been first grown in that island in 1507, but the first sugar was manufactured there in 1509. From Santo Domingo cane was soon carried to Porto Rico, but the exact date of its first establishment has not been ascertained. The first sugar mill in Porto Rico was established at San Germán about 1524. The first cane to be imported was the Criolla variety (Creole) and it was the only kind grown here for two hundred and fifty or more years. It came originally from India by way of Arabia and Spain.

In the early years of the nineteenth century this kind was rapidly and quite completely superseded by the Otaheite or Caña Blanca. Just when or by whom this cane was first brought to Porto Rico is not known. It was carried to Cuba in 1795 by Francisco de Arango and it probably reached this Island only a little later. At about the same time, quite likely as an admixture in this first importation, a few seeds reached the Island of the kinds now known as Cristalina, Rayada and Morada or Louisiana Purple. These attracted no attention and were not planted in separate cultures until after the epidemic of 1872. They were simply strays occasionally seen in fields of Otaheite, which for seventy-five years after its first importation continued to be the only variety intentionally planted.

In 1872 attention was first seriously called to a disease or epidemic that was devastating the fields of Otaheite cane in the district about Mayagüez on the western side of the Island. To this day the nature of this outbreak is unknown. It gradually extended until the entire region between San Germán and Arecibo was involved. Various commissions were appointed to study it. Its cause could not be determined and no effective remedy was found. It was noted, however, that these other kinds occasionally mixed with the Otaheite were much less injured. They were finally selected out and planted instead of the susceptible Caña Blanca, and as in so many other instances this was the only practicable means for combating this cane disease. This naturally led here, as in other countries, to a great interest in cane varieties and a considerable number of other ones were imported in the hope of finding still better and more resistant kinds. A full account of this interesting experience has come down to us through the effort of Dr. Agustín Stahl of Bayamón, who gathered together the reports of the various commissions, of one of which he was a member, and published them with various comments of his own in a pamphlet of 138 pages entitled "*La Enfermedad de la Caña de Azúcar en Puerto Rico*", dated 1880.

From the "Memoria de la Enfermedad de la Caña de Azúcar", by Antonio Ruiz Quiñones, dated August 1877, as quoted by Dr. Stahl, it seems that at some time prior to that date there had been an importation of Cristalina from Cuba. He also mentions another importation from Cuba made apparently just prior to this date by Patxot, Castello & Cía. of Cabo Rojo, owners of the Hacienda Monserrate, of three kinds called Caña Cristalina de las Indias, Caña Cristalina de Otaheite and Caña de Cintas Moradas de Bengala. From the descriptions these seem to have been respectively, Cristalina, Calancana or Green Ribbon and Rayada. Calancana or Green Ribbon is thus the only variety introduced into the Island prior to this outbreak of disease aside from the five that had been here since the early days of the century, namely, Criolla, Otaheite, Rayada, Morada and Cristalina. Interest in introducing new varieties now became active. Dr. Stahl established a nursery at Bayamón for the propagation of new kinds and the sale of seed cane. In the *Revista de Agricultura, Industria y Comercio* for 1887, page 174, is an article describing this nursery and listing the following varieties and the prices at which seed could be obtained:

Cavangerie	Palo Rojo Claro
Criolla	Gigante
Cristalina	Imperial del Brasil o Calancana o Carandali
Lajaina o Borbón	Reina de Caledonia
Kakoe	Salangore Blanca
Otahiti o Blanca	Salangore Rayada
Malabar de o Morada o Listas	Salangore Roja o Morada
Moradas	Saconi (Sacuri)
Palo Rojo	Tamarin

In the summary of his work on the cane disease, page 134 (1880), Dr. Stahl mentions 23 varieties and gives partial descriptive notes. Saconi and Kakoe are not included and to one he gives no name. Those not included above are the following:

Bambú Rosada	Pinang
Bambú Rosada de Rayas Moradas	Rosada—Morada
Diard	Verde Zic-Zac
Lousier	

Fernando López Tuero, who was Director of the Spanish Agricultural Experiment Station located at the farm Las Monjas near Río Piedras, published a book in 1895 entitled "Caña de Azúcar". He lists 22 kinds that he has known in Porto Rico. This list corre-

sponds closely with that of Dr. Stahl the only additional names being as follows:

Bengala

Guingham

Polvo de Oro

From a foot note, page 10, we learn that Carandalí, Salangor, Cavangerie, Palo Rojo, Tamarín, Pinang, Diard, Rosada Morada and others were introduced prior to 1879 from Jamaica, Guadeloupe and the other Antilles by Dr. Grivot Grand-Court of Mayagüez and that Reina Caledonia and Gigante were brought from Trinidad by Dr. Stahl.

This completes the history of cane introductions prior to the American occupation in so far as it has been possible to trace.<sup>1</sup> Very few of these kinds have been maintained as pure cultures in any part of the Island. Such of them as still exist are scattered through the fields in mixed plantings. Tradition has handed down the names of some of them, but of others even the names are forgotten. The attempt has been made to gather up these forgotten kinds from all parts of the Island and to bring them into the experimental plots at this Station for further study. When a name could be associated with them it has been provisionally retained. Otherwise they have been given serial numbers under the letter "X" to indicate that they are unknown. The attempt to identify them has led to a rather exhaustive search of all available sugar-cane literature. In some cases this has been successful, but many of these strays are still held under their X numbers. Some of them are evidently of considerable value and it is strange that they have not come into more general cultivation. No one in Porto Rico since the time of Dr. Stahl seems to have given the question of the old cane varieties the attention which it so rightly deserves. The mere fact that mixed plantings are almost universal shows how completely it has been disregarded. This careless custom of mixing different varieties in the same planting is costing this Island literally millions of dollars annually.

The American occupation and the bringing of Porto Rico inside

(1) The following interesting communication was received from Mr. E. D. Colón, covering some more recent historical investigations:

"GOVERNMENT OF PORTO RICO,  
"DEPARTMENT OF AGRICULTURE AND LABOR  
"INSULAR EXPERIMENT STATION

"RÍO PIEDRAS, P. R., mayo 23, 1921.

"SR. DON F. S. EARLE,  
"Estación Experimental Insular,  
"Río Piedras, P. R.

"MI ESTIMADO MR. EARLE:

"Decidí ayer reunir, antes que algo me impidiera hacerlo antes de su partida para Cuba, los datos más significativos que tengo en mi poder con respecto a las variedades



de la caña de azúcar que existían en Puerto Rico en 1878 y las importaciones hechas entonces hasta 1880.

"Los he obtenido, a propósito de mis investigaciones sobre la agricultura de Puerto Rico antes de 1898, de los archivos de la Diputación Provincial de Puerto Rico, del expediente intitulado 'Incidentes de los expedientes sobre la enfermedad de la caña de azúcar y comisiones nombradas con tal motivo por el Ayuntamiento, Centro Hispano Ultramarino y Sociedad de Agricultura de la Ciudad de Mayagüez,' Número 5, legajo 17; y, a propósito de las respuestas dadas por los hacendados de la Isla a un interrogatorio enviádoles por la Comisión Permanente de la Diputación Provincial acompañando el Informe dado a la Excm. Diputación Provincial sobre la Enfermedad de la Caña de Azúcar en el 4º Departamento de la Isla de Puerto Rico por los Comisionados al efecto, Dres. D. C. Grivot Grand-Court y Don Agustín Stahl, y Ldo. José Julián Acosta y Calbo.

"A excepción de algunas notas explicativas, me ha parecido que haría más interesante este informe el citar directamente aquellas porciones contentivas de los datos que creí más significativos. Siguen a continuación:

"1. 'La de lista verde se encuentra en abundancia en algunas haciendas de Guánica.' Carta de L. Bas Nadal de Mayagüez al Sr. Presidente de la Diputación Provincial bajo la fecha julio de 1878.

"2. '... entre la cual (la caña Blanca) se encuentra bastante de listas verde llamada vulgarmente (Carandali). En 1870, cuando fomentamos la plantación por necesidad tuvimos que sembrar, mezclada con la Blanca, mucha de la morada y de la morada de listas; pero las hemos extirpado por su escaso rendimiento y mucha dureza. Tenemos ya una cepa de Salangore que nos proponemos multiplicar . . . y la Salangore que existe hoy plantada en diversos puntos, presto dará a conocer sus buenos o malos resultados. . . . La caña Cristalina que existe en esta Isla ha venido de Cuba, según entiendo, y la Salangore de Jamaica.' *Idem* de Don Pablo Morales, julio de 1878.

"3. 'Desde esa fecha (cosecha del 77) acá, viendo que la enfermedad en esa clase de caña (Blanca) es tenaz y hace cada vez mayores estragos, resolví y he podido conseguir plantar algunas semillas de caña "Cristalina" y la conocida vulgarmente de "Cinta" traídas de la Isla de Cuba. . . .

"En lo que va de este año he importado de Barbados (20 barriles) semilla de caña Blanca que allí llaman de 'Bourbón', pero que a juicio de los pocos, pequeñísimos conocedores de la planta se designa con el nombre también de 'Belouguet Blanche', caña que tampoco florece, según de Barbados escriben.

"En poquísima o en pequeñísima cantidad he empezado a formar semillero de la caña *Carandali* o *Calancana*. . . . Esta clase de caña me dicen la hay en la costa Este de la Isla (Humacao, Naguabo, Fajardo, etc.) y según voces su rendimiento satisface a aquellos hacendados, tanto, que la propagan cuanto pueden.

"Como prueba positiva hice sembrar en 1877, en magnífico terreno y en gran cultura ocho cuerdas de caña morada o prieta que mucho se conoce en el país por su antigüedad, pero el poquísimo rendimiento al molerla este año me ha hecho desistir de su cultivo en adelante.

"De lo expuesto . . . que tengo en mi Hacienda Josefa, una de las más castigadas en el Departamento por la enfermedad, seis variedades de cañas a saber:

"'La *Otahiti*, que es la atacada de la tisis;

"'La *Cristalina*, de Cuba, que no deja de prometer;

"'La *Cinta*, veteada de morado y amarillo, también traída de Cuba, que no la conceptúo sino de mediano rendimiento;

"'La *morada* o *prieta*, que trato de desechar;

"'La *Bourbon* o *Belouguet Blanche*, importada de Barbados;

"'La *Carandali* o *Calancana*, veteada de amarillo y verde, traída o conseguida en un cafetal del interior del Departamento.'

*Idem* de Don José A. Annoni, Hormigueros, julio de 1878.

"4. 'En cuanto a lo que se dice en el "Informe" de que la caña Morada resiste más, nada tiene de particular si tomamos en cuenta que mucho antes de conocerse dicha enfermedad en la Isla ya se sabía que la caña Morada en terrenos estériles es mucho más vivaz que la Blanca. . . .'

*Idem* de Don Francisco Salichs, Humacao, agosto de 1878.

"5. 'Al contestar dicha carta debo hacerlo siguiendo las preguntas que la misma encierra; a saber:



"19 Las cañas que tengo en cultivo en esta finca son a mi corto entender, cinco clases:

"Primera: Caña morada o bambú, de la que queda muy poca en esta finca, pero abundaba anteriormente, y voy haciendo desaparecer por no ser partidario de ella;

"Segunda: Las Guingans, o cañas de cinta morada y verdes, de las que hay muy pocas;

"Tercera: Las bambús blanches o de cintas verdes y blancas, también en pequeño número;

"Cuarta: La Blanca de Otaití que es la que se cultiva en mayor escala; y

"Quinta: La caña verde, verdadero bambú por su forma, y que existe en bastante abundancia en la finca, pero ligada en los mismos tablones a la caña de Otaití. Esta caña por su desarrollo, su buena vegetación y el rico jugo que encierra, trato de estudiarla haciendo de ella semilleros con ese objeto, pues creo sea más ventajosa en esta jurisdicción que la caña de Otaití. Se conserva siempre lozana y verde y aún en el tercer corte la veo sobresalir en desarrollo a la Otaití. Ignoro su verdadero nombre y cómo haya sido introducida en esta finca, pues la encontré ya aquí en el año 71.'

*Idem* por D. S. I., Hacienda Carmen, Vega Alta, agosto 4 de 1878.

"6. Entre ellas (plantaciones de caña Blanca o de Otaití) se encuentran sin orden ni colocación meditada; y sólo al acaso, algunas cepas de caña morada y alguna que otra de la de listas. Estas, en nuestro concepto, provienen de la morada misma, que en una sucesión de años que no podemos precisar, sufre esas transformaciones, ya en la propia cepa, ya en otras que de su semilla producen.' *Idem* por L. Igaravidez, José G. Padilla, Francisco Alero, Vega Baja, Puerto Rico.

"7. 'Que existiendo con alguna abundancia la caña de cintas verdes, llamada *Carandall* o *Calancana* en la costa Este de esta Isla (Humacao, Fajardo, Naguabo, y en los campos de Toa Alta y las Vegas), se envíe a costa de esta Excm. Diputación la mayor cantidad posible de semillas de la misma al 4º Departamento y que se repartan entre aquellos hacendados.' Comunicación al Señor Comisario de Administración Local de la Excm. Diputación Provincial, por Don Ramón Power, noviembre de 1878.

"8. '... los informantes añaden que por mucho cuidado que se ponga siempre se perderá un 50 por ciento de las semillas importadas de Oriente, como ha acontecido con las encargadas por el tantas veces citado, Dr. Grivot Grand-Court.' Informe de su Comisión a la Sociedad de Agricultura de Mayagüez, junio 23 de 1879.

"Desde el 1875, Don Santiago McCormick de San Juan hacía propaganda para la importación a Puerto Rico de nuevas variedades de cañas, habiendo dado a la publicidad en el Boletín Mercantil del 3 de julio de 1879 datos sobre ciertas variedades de caña aclimatadas entonces en Trinidad, introducidas de Oriente e islas del Pacífico, por Mr. H. Prestoe, Director de los Jardines Botánicos de Trinidad en esa época y amigo personal del Sr. McCormick desde hacía 25 años.

"En 19 de agosto de 1870 acordó la Diputación Provincial el envío de Don Santiago McCormick a Trinidad para la importación de nuevas semillas de cañas. En noviembre 10 de 1879, de regreso ya, daba cuenta el Sr. McCormick a la Diputación Provincial de haber llenado su cometido.

"9. 'Nota del contenido de 42 barriles de semillas de cañas introducidas de la Isla de Trinidad por encargo de la Excm. Diputación Provincial.

"23 barriles semillas de la Reina Caledonia.<sup>1</sup>

"No. 1.—Barril con Salangore Verde.<sup>2</sup>"

<sup>1</sup> Caledonian Queen Cane is a pale or greenish purple cane, close jointed, and extremely vigorous. The leaves are remarkably broad, and their bases are nearly destitute of the setae or "cowitch" common in most canes. This cane is said to attain enormous dimensions in the East, and to be one of the most sacchariferous. The short joint is a feature which is generally considered objectionable—accompanied as it usually is by great hardness of cane tissue. In this respect, however, the Caledonian Queen Cane is an exception, and the ready way in which both length of joint and diameter of cane are affected by manure—the natural soil at St. Ann's being the poorest—indicates great variability of habit, and suggests gigantic growth under the influence of rich alluvium.

<sup>2</sup> The green Salangore is so named from its retaining a green color on the cane much longer than usual, although when fully ripe the color of the cane is yellow, but not so bright a yellow as that of a well-ripened Otaheite. This variety is the freest growing of all the varieties in the Gardens except the giant Claret Cane, and its erect habit is even more striking than in that variety. Both in respect to length of joint and diameter of cane it is equal to it—thus being the largest yellow cane grown here. The foliage is large and heavy as in Nos. 1 and 2 and 6 of the former series, but completely deciduous so that the operation of "trashing" is with it reduced to a minimum. The most striking feature of this cane—besides its size—is the broad white ring just below each joint.

of the American tariff lines gave the sugar industry a great impetus. Several large American factories were established and the Federal Experiment Station at Mayagüez was founded.

The next introduction of cane varieties seems to have been due to the initiative of that institution. Its activities in connection with cane varieties are outlined by Director D. W. May in a letter dated January 11, 1921, as follows:

"The first brought into the Island was in December 1904, when we received from the Station at Audubon Park, Louisiana, the following: D-74, D-95, D-117, T-77, B-347, Louisiana Purple, Louisiana Striped, Tibboo Mird, White Bamboo, and Rose Bamboo. Since that time we have received a great many seedling canes from the British Islands, especially Barbados. Other countries from which we have received seedling canes are Java, Mauritius, Egypt, Demarara, Martinique, Argentine and the Virgin Islands. The Station began breeding cane in 1906. Some very good varieties were produced and distributed over the Island. When the Sugar Planters' Station was established we stopped the breeding of canes as it was undertaken there. We have again taken it up in the last three or four years. There have been so many canes bred on the Island and sent out not only by this Station but by Guánica and Fajardo Sugar Companies that the question of varieties is intolerably mixed."

The writer wishes to emphatically endorse this final statement made by Director May. Cane varieties in Porto Rico are "intolerably mixed". Nothing in connection with cane culture is more urgently needed than to get them separated again into pure cultures. Of the two hundred varieties bred at the Mayagüez Station from 1906 to 1910 all seem to have been lost in this general mixture. One of them P.R.-68, turned up in the mosaic-immunity tests at Santa Rita (see Bull. 19) but no trace of the others has been found.

The next definite information in our possession regarding importations of varieties is contained in the following letter addressed by Mr. Harold J. Sewall of Naguabo to Mr. H. B. Cowgill of this Station under date of April 26, 1915:

"Replying to your inquiry of the 16th ult.: I have received and brought in from Antigua, B. W. I., the following canes:

Introduced 1909:

Sealey Seedling, not here previously.

D-109, not here previously.

B-109, not here previously.

B-156, not here previously.

B-4596, not here previously.

B-208, already grown at Mayagüez.

B-147, already grown at Mayagüez.

B-306, already grown at Mayagüez (as B-347).

D-74, already grown at Mayagüez.

D-625, Grown at Canóvanas and Fajardo as D-116.

## Introduced 1911:

B-1529, not here previously.

B-4507, not here previously.

B-6436, not here previously.

D-848, not here previously.

D-1111, not here previously.

St. Kitts Seedling, a sport of B-298, to which it reverts when grown here.

"The above canes were sent me by J. C. Waldron of Antigua, now returned to Santa Catalina, and I believe that the planters of this Island are greatly in Mr. Waldron's debt. At the time he shipped the first lot of canes he had never met me, but had corresponded with me on cultivation methods. Later I visited him in Antigua and brought back some important canes.

"With regard to the now famous Yellow Caledonia cane, I am glad to be able to throw light on its history here, but very sorry not to be able to claim its introduction. As early as 1906 Mr. D. W. May received this cane, I believe, from the Planters' Station in New Orleans, under the name of Rose Bamboo. In 1908 I got it from him, and on growing it discovered that it was not Rose Bamboo, which is the Hawaiian title for *Cristalina*, but the cane pictured in Noel Deerr's book as *White Tanna*. This in Hawaii is called Yellow Caledonia (see Eckert and Deerr's bulletin on cane nomenclature). This fact became apparent in the spring of 1909, when Mr. E. H. Olding received from his brother-in-law at Ewa, Hawaii, a few cuttings of Yellow Caledonia which were turned over to me and planted close to the cane I had over a year previously gotten from Mr. May. Thereafter we called the cane Yellow Caledonia. Probably the report that Mr. Olding introduced the cane here sprang from his receipt of these cuttings.

"It is, of course, a fact that cuttings of this famous cane were also sent by Mr. May to other planters, but with the single exception of Guánica no one gave them any care or attention. Seedling work was begun at Guánica at about the same time that I took it up—1909—and they were practically alone in recognizing the value of the new canes. Mr. Marr at Canócanas had gotten one or two canes from Demerara, notably the cane D-625 which caused so much trouble under the number D-116.

"To Mr. D. W. May belongs the credit of being the pioneer, and it is the fault of the planters themselves that they did not appreciate the value of the canes which he sent to quite a number of them. They did not, however; in fact, seedling canes were decidedly unpopular in 1908 and 1909.

"Yellow Caledonia is today grown everywhere in this section. There are hundreds and hundreds of acres of it in the San Cristóbal fields and both Fajardo and Borinquen are planting it as fast as they can get it. It has added close to five tons an acre to our yields hereabouts.

"Although I may not claim the credit of introducing Yellow Caledonia, I may without presumption insist that I made it stick. On my own lands and on the fields of the company where in the fall of 1909 I planted it in areas of some size, the cane made a phenomenal growth and gave a splendid appearance. In the mill it gave the average amount of sugar. It stood up well on poor soils and under neglect. Everybody wanted it by the planting season of 1911 and I sent cuttings to Aguirre and to Fajardo. All of the Yellow Caledonia in the east

end came directly or indirectly from this place. I don't know why it never survived in the west end, but it never did.''

This interesting letter is of great historical value, since it fixes the date of importation of many kinds and gives so vivid a picture of the first general planting of the Yellow Caledonia. It also illustrates the difficulty of interesting planters in new varieties except under the stress of some calamity that forces attention on this question.

About 1908 Central Guánica secured the services of Charles T. Murphy of Barbados and actively began the building up of a variety collection and the breeding of new seedlings. After the death of Mr. Murphy he was followed by Mr. H. Bourne, and he by Mr. E. H. Barrow, both from Barbados. It seems quite certain that Mr. Murphy brought with him a considerable number of Barbados canes. Many of them are mentioned in his reports for 1910, 1911 and 1912, copies of some of which are available in the files of this Station. Unfortunately, owing to changes in personnel and other factors, it has been impossible to secure exact data as to Guánica's importations.

In 1910 a considerable number of variety plots existed on the Carmen property of Central Aguirre. The seed mainly seems to have come from the Mayagüez Station. This planting was seen by the writer on his visit to the Island at that time. At the same time a much larger collection was seen at Central San Cristóbal, but this seems to have been Mr. Sewell's importation that has already been noted.

Mr. Sewell's letter calls attention to the direct importation of a few canes from Demerara by Mr. Marr of Central Canóvanas at some time prior to 1909. And it is known that Central Mercedita of Ponce made a direct importation from Barbados in 1911 of the following ten kinds (See 2nd. Ann. Rept., p. 11):

B-1809	B-6835
B-3750	B-7169
B-3859	B-7245
B-6293	B-8660
B-6341	Diamond-185

It succeeded in bringing in a few seeds of Badila and of D 1135 after their detention for nearly three years in quarantine in Washington. This completes the history of cane introductions in Porto Rico in so far as it has been possible to trace them. Central Fajardo maintains a large variety collection and has produced many new seedlings, but does not seem to have made direct importations



## DESCRIPTIONS AND DISCUSSIONS OF CANE VARIETIES IN PORTO RICO

From Mr. Earle's most excellent statement the idea and arrangement of the following varietal descriptions can be easily understood and little further explanation is necessary. The writer, in arranging the varieties, has followed a strictly alphabetical arrangement rather than dividing the canes discussed into the named varieties, the Barbados and Demerara seedlings, the Porto Rico seedlings, etc., although all varieties pertaining to any one group or section have been assembled under one general heading, such as the Java canes, including E. K. 28, Kassoer and the P.O.J.'s, the Chinese canes, under which come canes so widely separated alphabetically as Cayana and Zwinga, etc., etc. As an appendix a strictly alphabetical cross-index has been prepared, in which the reader will find page references to every variety herein discussed.

In the case of the varieties described by Mr. Earle, which represent about 35 per cent of the descriptions herein included, his descriptions, indicated by an asterisk in front of the name of the variety, have been retained practically *in toto*, only an occasional addendum having been made, and in some cases the larger part of the discussion of the cane's qualities has also been retained, although in most cases the economic status of the older varieties has so changed for the better or worse—usually the latter—in the past five years that most of the discussions have had to be entirely rewritten. With the exception of the Porto Rican seedlings, to which about the only references are to be found in literature published here and largely listed in the Bibliography in Appendix C, and of the Tucumán seedlings, of which little is definitely known as yet, the writer has included at the foot of the discussion of each kind a pair of pertinent references to that particular variety in the literature. His first intention was to prepare a general bibliography of the cane varieties herein treated, but, after working for several months in that direction, his bibliography had acquired such kilomeric proportions that it was decided that the reader could much more readily encounter the references to the particular canes in which he happened to be interested if the most important of these were placed directly under these varieties, although Appendix C represents over 160 references to articles in regard to varieties today prominent in Porto Rico.



Technical descriptions and discussions are necessary evils at best and the writer has attempted to make this manual of more general interest than such works generally are to the average planter and amateur enthusiast in varietal work by preparing as many illustrations as possible of the more prominent canes today cultivated, not only in Porto Rico, but in the entire world. Around fifty of these varieties are illustrated in colors, while about an equal number are shown in half-tones. The author feels confident that a far larger proportion than otherwise of persons interested in cane varieties will compare their varieties with these descriptions if they have something more graphic to utilize than the mere technical descriptions, which by themselves are generally sufficiently dry to dessicate rather thoroughly the average person's budding interest in this most important phase of sugar/cane improvement.

In the following pages will be found such data as is now available concerning each of the two hundred or so more or less prominent varieties recorded as occurring in the "Isle of Enchantment".

## PRINCIPAL CANE VARIETIES TESTED IN PORTO RICO

Badilla (New Guinea 15). See Plate I, opposite page 85.

This is an old variety which has given most excellent results in the past decade in Mauritius, Reunion, Trinidad and Queensland, and more latterly in Hawaii. It is a dwarf type of cane, a splendid germinator, a fair stooler and a cane of early maturity and high sugar content and purity. It was imported by the Insular Experiment Station from Washington (Bureau of Plant Industry) in January 1921. It is highly resistant to Mosaic Disease, but takes the disease occasionally.

Erect, good vigor, a strong stooler, seldom flowers, stalks dwarf type, short and stout, blackish purple, scanty bloom. Internodes short, cylindrical, slightly enlarged at base, slightly staggered, furrow slight to none. Nodes even; growth ring broad and even, oblique, white to concolorous; root band broad, oblique, white to concolorous, rudimentary roots few and scattered, two to three in a row, purple; leaf scar glabrous, appressed behind; glaucous band constricted, broad and well defined. Buds orbicular, large, 12 by 16 mms., not exceeding growth ring, purple, margins, becoming uniformly purple with age, germination sub-dorsal, premature, margins rather narrow and abruptly shouldered at sides, glabrate, no basal plac. Leaf sheaths with scanty vestiture of short white hairs, sides glabrous, glaucous, purple, inner base heavily tinted with purple; throat wide, nearly glabrous; collar very wide, well defined and reaching mid-rib, lannate, with very short velvety hairs; ligule medium width, 3-5 mm.; slightly fimbriate; ligular process short,  $1\frac{1}{2}$  to 2 cms. on one side only. Leaf blades spreading, erect tips, very wide, 11-13 cms., yellowish green, margins uniformly and minutely serrulated, very sparse basal ciliation.

The Annual Report of the Reunion Experiment Station for 1912-13 reports a very good yield of this cane of 42 tons per *arpent* (40,000 sq. ft.) and an average yield from various fields of 24.7 tons per *arpent*. In one test in Mauritius this variety gave a sucrose content of 18.21 per cent in the juice and a purity of 94.1 per cent—a remarkable analysis. Trinidad Bull. 16 in 1917 reported Badilla as occupying first place in sugar produced per acre the previous year. Both Queensland and Hawaii have reported excellent results with this unusual looking variety and S. Asunción and M. Medina in the *Philippine Agricultural Review*, Vol. 18, pp. 107-23, report that



# PLATE I



Badila



B. 39



B. 67



B. 117



B. 119



B. 147



B. 154



B. 208



B. 1030

"Badilla was found to be the best yielder of all the varieties tested, giving an average yield of 2.6 tons of sugar per acre in one test and over 4 tons in another. This production is more than twice that of the popular variety Negros Purple, the standard of comparison in all tests, which yielded under 1.2 tons. Badilla also has a better ratooning power than the others."

The following analyses have been made:

Location	Date	Age	Mill	Tons cane p. acre	Brix.	Sucr.	Purity	Tons sugar p. acre
Aguirre .....	XII 1-24 .....	10½ mth.	Hand. ....		14.60	11.93	\$1.70	
Aguirre .....	XII 15-24 .....	7 mth.	Hand. ....		21.05	19.46		
Exp. Sta. ....	X 15-21 .....	1 year	Hand. ....		16.30	12.96	75.1	
Exp. Sta. ....	II 20-26 .....	16 mth.	Cent. ....	38.50	19.59	17.99		
B. H. 10 (12) ..	II 20-26 .....	16 mth.	Cent. ....	54.81	17.43	15.00		6.55
Ballio Fruit Co.	V 14-26 .....	16 mth.	Hand. ....		22.40	20.93		
B. H. 10 (12) ..	V 14-26 .....	16 mth.	Hand. ....		18.85	16.80		

In the tonnage comparison with B. H. 10(12), Badilla was planted with fifteen others of the most promising canes at the Station and stood first amongst all these in Brix, Sucrose, Purity and, therefore, factor of recovery. In production of sugar per acre it stood third. Well worth further trial, particularly on the north-coast hill lands.

#### OTHER REFERENCES

- EASTERBY, H. T.—Twenty-Third Annual Report of the Queensland Bureau of Sugar Experiment Stations for 1923.  
 ROSENFELD, ARTHUR H.—Annual Report of the Special Technologist for Cane. Annl. Rept. of the Ins. Expt. Sta. of Porto Rico, 1923-24, pp. 62-8.

#### \* Bambú Blanca.

An old variety abundantly mixed with Oraheite, Penang, Rayada and Cavengerie in most of the cane fields of the north coast, not seen in pure cultures. Country of origin and time of importation not known.

Erect, of good vigor, medium stooling, sometimes arrows, stalks of medium diameter, 3 to 3¼ cm., green, no flush and no bloom. Internodes straight, cylindrical, medium length, furrow slight and poorly marked. Nodes prominent, slightly larger than the internode; growth ring narrow 1 to 1½ mm., not swollen, concolorous; root band slightly enlarged, about 10 mm. wide, paler than the internode; rudimentary roots crowded, swollen, yellowish, the centers dark, in 4 rows; leaf sheath glabrous, slightly oblique, appressed behind; glaucous band 8 to 10 mm. wide, conspicuous, not constricted. Bud ovate, acute, about 10 × 12 mm. at first not exceeding growth ring



but often enlarged later, margin medium width, uniform, germination subapical, base, sides and apex sparingly hirsute. Leaf sheaths with a dense vestiture of conspicuous erect whitish hairs, somewhat glaucous, green, not tinted; throat lannate and with an abundant vestiture of long hairs; collar broad, conspicuous, reaching the midrib, densely glaucous but not lannate, ligule short about 3 mm., margin nearly even; ligular processes none or poorly developed. Leaf blade flat, suberect with declined tips, 6 to 7 cm. broad, dark green, serrulations very minute, the margins at base ciliate.

A variant with white stripes in the leaves is not uncommon.

No chemical data are available.

Its general vigor, comparative freedom from root disease and adaptability to varied soil conditions are sufficiently proven by its persistence as an important element in so many mixed cultures. Its ripening period, sugar production and adaptability to special conditions should be more fully tested. It is, however, quite susceptible to mosaic and to the gum disease.

The cane described on another page as Penang is often found growing with this one and may easily be confused with it. It can be distinguished by the obtuse, more nearly glabrate buds, by the broader, swollen growth ring and by the lilac tint of the leaf sheaths.

Another unknown cane found in these mixed plantings superficially resembles this one but has suborbicular buds and nearly glaucous leaf sheaths.

The white Bamboo mentioned by Mr. May as introduced from the Audubon Station, Louisiana, in 1904 has not been traced. Mr. Crawley, the former Director of this Station, in a manuscript note records seeing this cane at Añasco and that it had a conspicuous wine-colored stain on the inside of the leaf sheath at the base as in Yellow Caledonia. This shows it could not be the cane under discussion.

#### **Bambú Rayada.**

This name may be given to a variant of the above, having white stripes on the stalks and leaf sheaths which is occasionally found growing with the typical form (planted as X-25).

#### **Bambú Rosada.**

Mentioned by Dr. Stahl (p. 136), who says:

“A beautiful rose-colored cane which easily loses its color with age and bad cultivation. It can compete with the Caña Blanca.”

It seems to be the same cane mentioned by López Tuero (p. 9) under caña Bambú. He describes it as rose-colored when young,

but later yellowish; says it is very stout, vigorous and resistant but hard and low in sugar; advises planting it on the outside rows of the fields.

The cane has not been traced.

The Rose Bamboo imported from Louisiana in 1904 (see letter of Mr. May, p. 79 proved to be Yellow Caledonia (see letter of Mr. Sewall, p. 79.

#### **Bambú Rosada de Rayas Moradas.**

Listed by Stahl (p. 136), but without description. No other references found. Probably only another name for Rayada.

#### **The Barbados Seedlings.**

Of the vast number of seedlings bred by Mr. J. R. Bovell in Barbados only a comparatively small number of these have reached Porto Rico. Most of these belong to the earlier series that was designated simply by the initial B. All of these older varieties that we have here are good canes but none of them have proved to be superlatively good. Most of them have been rather widely disseminated but only a few have been planted on a large scale. Such facts as have been gathered concerning each of them will be found below, including some data on the famous BH 10(12), our most widely planted variety in Porto Rico today. This remarkable general-purpose cane comes under the heading of "Hybrids" in the Barbados classification, *i. e.*, it is a seedling of known parentage, obtained by emasculating flowers of good variety before the anthers open, bagging them to prevent promiscuous pollination and pollinating them with pollen of the male parent which has also been bagged to prevent contamination by unknown wind-borne pollen. A later series of ordinary seedlings are given the letters Ba, while the letters B.S.F. signify self-fertilized seedlings, obtained by bagging some of the better varieties before the anthers open so as to ensure that they are not cross-fertilized.

#### REFERENCES

BOVELL, J. R., & D'ALBUQUERQUE, J. P.—Seedlings Canes and Manual Experiments for the Season 1909–1911. Barbados.  
*Idem.*—*Ibid*, 1911–13.

B-39. See Plate I, opposite page 85.

Obtained in November, 1924, from Hon. John R. Bovell, Director of Agriculture in Barbados and producer of this variety.

Erect, at length recumbent, good vigor. Stalks long, medium girth, green turning yellowish with age, no bloom, long, parallel,

striations. Internodes long, almost cylindrical, enlarged and shouldered opposite bud, distinctly staggered, broad, shallow, cicatrized furrow. Nodes slightly constricted, oblique; growth ring broad and prominent, especially at back opposite bud, green to greenish brown; root band broad, oblique, yellow to green; rudimentary roots large, conspicuous, few and scattered 3-4 in rows, purplish brown; leaf scar glabrate and appressed behind; glaucous band constricted, broad and conspicuous. Buds lanceolate, large, swollen, 10-12 mm., exceeding growth ring by one-third, germination apical, margins of medium width and on upper half only, glabrate, no apical tufts, heavy basal plaes. Leaf sheaths with heavy dorsal vestiture of long tawny hairs, glaucous, heavily tinted; throat broad and well defined, glabrate except for sparse straggling hairs at margins; collar wide, reaching midrib, glaucous; ligule narrow, enlarged at center, nearly even; stubby trace of ligular process on one side only. Leaf blades spreading, with declining tips, medium width, about 6 cms., dark green, very minutely serrulated.

Planted out in tonnage experiments in fall of 1925. No data available as yet.

#### REFERENCES

D'ALBUQUERQUE, J. P.—Rept. on the Sugar-Cane Expts. for the Season between 1923-25. Barbados Dept. Agr. 1926.

BOVELL, J. R., AND D'ALBUQUERQUE, J. P. *Idem*, 1922-24.

B-67. See Plate I, opposite page 85.

Also obtained from Hon. John R. Bovell, Barbados in 1922

Erect, at length recumbent, fair vigor. Stalks long and medium girth, yellow, heavy flush, some bloom, discolored white striations and irregular blotches; internode medium to long, cylindrical, staggered, furrow traces to none. Nodes slightly constricted and oblique; growth ring broad and elevated, parallel, brownish to concolorous; root-band wide, oblique, concolorous, rudimentary roots fairly crowded and inconspicuous, 3 to 4 in a row, concolorous; leaf-scar glabrous, appressed behind; glaucous-band slightly constricted, broad and fairly well defined. Buds lanceolate, large, 12-16 mm., exceeding growth ring by one third to one half, germination sub-apical and premature, margins broad and flat, nearly glabrous, with a few very short hairs near tip, basal plaes with long coarse hairs. Leaf-sheaths lannated at back with short tawny hairs, sides glabrous, glaucous, light yellow to green color, inner base slightly tinted with purple; throat broad and yellowish; collar broad and angular, glaucous, reaching mid-rib; ligule narrow 2 to 4 mm., nearly even; ligular process broad and blunt, 1-2 cms., on one side only. Leaf blades

spreading with declining tips, medium width about 6 cms., yellowish green, margins minutely but uniformly serrulated, sparse ciliation at base.

This fine-looking cane has made an excellent record in Barbados, but with us has proved a consistently poor germinator and a poor ratooner. The writer wrote the producer of this cane, Hon. Jno. R. Bovell, in regard to the poor germination of this variety and in a letter dated March 12th, 1925, Mr. Bovell said:

"B 67 is too new a cane yet to say definitely what the germination is, but at the present time it is fairly good."

Planted at the Station in 1922 alongside B.H. 10(12), it never made growth as plant to compare with the latter and, while stooling fairly well as first ratoons, B.H. 10(12) was consistently of better appearance throughout the season. As second ratoons the B 67 practically disappeared, while the B.H. 10(12) alongside gave an excellent yield and is now growing vigorously as third ratoon. The B 67 is characterized by its very light-colored foliage.

The following analyses have been made at the Station:

Date	Age	Mill	Tns. cane per acre	Brix	Sucr.	Purity	Tns. sugar per acre
XI-7-24.....	11 months	Hand.....	.....	13.90	10.16	75.25	.....
XII-9-24.....	12 months	Hand.....	.....	15.70	12.59	80.19	.....
I-1-25.....	13 months	Hand.....	.....	16.14	13.51	83.71	.....
II-8-25.....	16 months	Cent.....	28.60	18.50	16.72	91.10	8.61
BH 10 (12).....	16 months	Cent.....	54.81	17.43	15.00	86.06	6.05

In the tonnage experiment with B.H. 10(12), for which figures are given above, B-67 stood second in sucrose and third in purity amongst sixteen kinds, but was thirteenth in production of sugar per acre. Hardly seems likely to compete with B.H. 10(12) successfully in Porto Rico, as it appears to be a more delicate cane in every sense.

#### REFERENCES

- MENÉNDEZ RAMOS, R.—Ann. Rep. of Ins. Expt. Sta. of P. R., 1922-23.  
 ROSENFELD, ARTHUR H.—Rept. of the Spec. Technologist. *Idem*, 1924-1925.

#### B-88.

A cane under this name was found growing at Río Grande, by Earle. There is no record of the introduction of this kind. Its identity has not been determined.



## B-109.

Parentage unknown. Introduced from Antigua by Sewall in 1909. Cultivated at this Station since 1911 from seed sent by Sewall, and to some extent at Humacao and other parts of the east coast. It was in cultivation at Guánica in 1912, but has been abandoned there.

Erect or at length declined, stooling only moderate, arrows rather freely. Stalks long, medium stout, green, then yellowish, no flush, little or no bloom. Internodes medium length, straight or very slightly staggered, cylindrical, furrow very slight or none. Nodes not constricted; growth ring narrow, about 2 mm., somewhat swollen, concolorous; root band narrow 6 to 8 mm., slightly swollen; rudimentary roots small, crowded, pallid in 2 to 3 rows; leaf scar glabrous; glaucous band well marked, not constricted. Buds obovate, broader than long with an apiculate apex, about  $9 \times 10$  mm., not exceeding the growth ring, margin narrow, uniform, germination subdorsal, nearly glabrous but with short scanty basal plaes of crisped hairs and a short scanty apical tuft from the under side of the bud. Leaf sheaths glabrous, green, but little bloom; throat with abundant vestiture of coarse hairs, densely lannate; collar broad, dark brown, reaching the midrib, densely lannate; ligule medium short, entire; ligular processes unequal, usually only one developed, sometimes wanting. Leaf blades spreading, rather broad, 7 to 8 cm., minutely but sharply serrulate, the base ciliate.

This cane is usually reputed to be low in sucrose. As in so many other cases, this comes from failure to understand its characteristics. It is a cane of considerable vigor and continues its growth late in the season. On low lands it is therefore slow in maturing and is usually cut before it is ripe. On hill lands it ripens as early as *Cristalina* and frequently develops even more sucrose. Up to February 4th it gave the highest sucrose of any kind analyzed in 1921. It seems to have more vigor and resistance to unfavorable conditions than *Rayada* and *Cristalina* and will usually give at least equal tonnage. Its greatest weakness is that it is not a very free stooler, usually giving comparatively few stalks to the hill. It was recommended by Mr. Earle for fall planting in the red shale hills.

B-109 is rather unusually resistant to root disease and it stands high in resistance to mosaic (see Bull. 19). Its reaction to gum disease has not been determined.

The following selected analyses show its sugar-producing qualities:



Kind	Date	Age	Arrows	Extr.	Brix.	Sucr.	R. S.	Puri	Fiber
Low land									
B-109.....	1914				16.14	13.88		86.0	
B-109.....	12-20-20	Rat. 14 mo.....	No	72.0	17.0	13.59	1.29	79.98	10.64
Cristalina.....	12-20-20	Rat. 14 mo.....	No	70.0	17.5	13.53	0.28	88.74	9.60
Hill land									
B-109.....	12-24-20	Pl. 16 mo.....	Yes	65.3	18.78	16.51	1.04	87.91	12.94
Cristalina.....	12-24-20	Pl. 15 mo.....	No	65.7	18.88	17.08	0.52	90.65	13.72
B-109.....	2-4-21	Pl. 16 mo.....	No	67.3	20.7	19.09	0.55	92.07	10.78
B-109.....	2-4-21	Pl. 16 mo.....	Yes	64.2	20.55	19.05	0.39	92.70	10.74
Cristalina.....	2-4-21	Pl. 16 mo.....	Yes	65.2	18.40	17.27	0.65	93.85	11.83

## REFERENCES

- EARLE, F. S.—The Resistance of Cane Varieties to the Yellow Stripe or Mosaic Disease. Ins. Exp. Sta. of P. R. Bull. 19; 1919.
- WATTS, FRANCIS.—Sugar-Cane Expts, in the Leeward Islands, 1919-20.

## B-114.

Included in the variety experiment at Carmen, Central Aguirre, Mr. Crawley's notes say "a green, long-jointed cane". When cut January 31, 1911, this plot gave the following results: tons cane, 68.59; brix, 16.90; sucrose, 13.25; purity, 78.4; ton sugar, 6.42.

We have no other records of this cane. Not seen.

## B-117. See Plate I, opposite page 85.

Kindly brought from Barbados in November, 1924, by Director of Agricultural Extension Otis W. Barrett, at the request of Commissioner of Agriculture Carlos E. Chardón.

Erect, later recumbent, good vigor, very similar to B.H. 10(12) in general appearance. Stalks long, medium girth, same general color scheme and blotched appearance as with B.H. 10(12). Internodes medium length, slightly tumid, staggered, no furrow. Nodes oblique and slightly constricted; growth ring very broad and prominent back of bend when recumbent, yellowish to brown; root band broad, oblique, light and later dark green, heavy wax deposit; rudimentary roots large, numerous and crowded, 4-5 in rows, green to brown; leaf shear glabrate, appressed behind; glaucous band broad, conspicuous and constricted. Bud large, 9 × 11 mm., plump, orbicular, just exceeding growth ring, germination apical, margins narrow and on upper third only, lannate, very conspicuous long and wide apical tuft, light basal plaes. Leaf sheaths very sparsely lannate at back, sides glabrate, glaucous, green and lightly tinted, inner base also slightly tinted; throat broad and well defined, covered with short, woolly hairs and marginal tufts of coarse long hairs; collar broad,

well defined, reaching midrib, lannate; ligule narrow except at center, nearly even, no ligular process. Leaf blades spreading with declining tips, medium width, about 6 cms., dark green, minutely and uniformly serrulated, scanty basal ciliation.

Planted out in tonnage experiments in fall of 1925. No data available as yet on behavior in Porto Rico.

## REFERENCES

- BOVELL, J. R., & D'ALBUQUERQUE, J. P.—Rept. on the Sugar-Cane Expts. for the Season between 1921-23. Barbados Dept. Agr.  
ROSENFELD, ARTHUR H.—Report of the Special Technologist for Cane. Annl. Rept. of the Insular Expt. Sta. of P. R., 1924-25.

**B-119.** See Plate I, opposite page 85.

Kindly brought from Barbados in November, 1924, by Director of Agricultural Extension Otis W. Barrett, at the request of Commissioner of Agriculture Carlos E. Chardón.

Erect at length recumbent, fine vigor, good stooler. Stalks long, medium girth, green to yellow. Internodes long, slightly tumid, staggered; furrow traces to none. Nodes constricted, oblique; growth ring broad and prominent, green to yellowish brown; root bands wide, oblique and concolorous; rudimentary roots few, small and scattered, 3-4 in rows, brownish; leaf scar lannate, appressed behind; glaucous band broad, conspicuous and constricted. Buds, medium size, 8 × 10 mm., just exceeding growth ring, ovate, germination subapical, margins flat, narrow and on upper half only, glabrate, very light basal plaes. Leaf sheaths with abundant dorsal vestiture of short, tawny, deciduous hairs, slightly tinted, inner base green; throat broad and well defined, covered with abundant vestiture of long coarse hairs; collar broad and well defined, reaching midrib, lannate; ligule very narrow, although slightly broader at center, nearly even; no ligular process. Leaf blades plicate, medium width, about 6 cms., dark green, with very prominent broad, white midrib, margins very minutely serrulated, sparse basal ciliation.

Planted out in tonnage experiments in fall of 1925. No data available as yet on behavior in Porto Rico, although its general appearance is superior to B.H. 10(12) in above-mentioned tonnage experiments.

## REFERENCES

- BOVELL, J. R., & D'ALBUQUERQUE, J. P.—Rept. on the Sugar-Cane Expts. for the Season between 1921-23. Barbados Dept. Agr.  
ROSENFELD, ARTHUR H.—Report of the Special Technologist for Cane. Annl. Rept. of the Insular Expt. Sta. of P. R., 1924-25.

**B-147.** See Plate I, opposite page 84.

Introduced from Antigua in 1909 by Mr. Sewall, but he remarks that it was previously grown at Mayagüez. He notes that it is good as both plant and ratoon but that it is hard to establish. In November, 1910, Mr. Murphy notes that it was growing slowly at Guánica, and in January, 1913, that it had been abandoned as it did not seem to succeed. Not seen by Earle. Early in 1925 it was brought to the Station from San Lorenzo, to where it had been imported from St. Croix recently by Assistant Agronomist Luis Serrano. It is now being grown for extension and study at the Station.

Hon. H. H. Cousins, Director of Agriculture in Jamaica, wrote of this variety in 1910:

“This cane showed up best at Long Pond Estate. One of the peculiar characteristics . . . is that prolonged drouth seems to have no effect on its growth after it has once started to point. At first it is rather disappointing, as it comes up very slowly and with yellowish leaves, but to those who know the cane this is one of its natural features.”

Mr. F. W. South, in reporting on the prevalence of disease in the West Indies in 1909-10 says that B 147 was always more subject to attacks of rind disease than any other variety. It is highly susceptible to Mosaic Disease.

Erect, fair vigor, stalks long, good girth, green to bright yellow, slight bloom, no flush. Internodes long, cylindrical, not staggered, furrow distinct for three-fourths the length of the internode, narrow, shallow and dark brown. Nodes constricted, oblique, growth ring medium width, even, green to concolorous; root-band wide, rather inconspicuous, oblique, concolorous; rudimentary roots small, crowded, inconspicuous 4-5 in a row, purplish to concolorous; leaf scar glabrate and appressed behind; glaucous band broad, conspicuous and constricted. Buds small,  $8 \times 10$  mm., flat, scarcely exceeding growth ring, ovate, germination apical, margins flat and narrow, abruptly shouldered at base, distinct apical tuft, heavy basal plates. Leaf sheaths with scanty dorsal vestiture, sides glabrate, light green, glaucous; inner base very slightly tinted with purple; throat broad, very sparse lannation, long and straggling marginal hairs; collar broad and well defined, reaching midrib, glaucous, ligule narrow, 2-4 mm., nearly even; ligular process very short and on one side only. Leaf blades spreading with declining tips, medium width, about 6 cms., light green, upper two-thirds of margins minutely serrulated, very sparsely ciliated at base.

## REFERENCES

COUSINS, H. H.—Bull. Dept. of Agr. of Jamaica, Vol. I, No. 3. 1910.  
 SOUTH, F. W.—A Report on the Prevalence of Some Pests & Diseases  
 in the West Indies for the year 1909-10. West Indian Bulletin,  
 XI, 2, pp. 74-5.

**B-154.** See Plate I, opposite page 85.

Also brought from Barbados in November, 1924, by Mr. O. W. Barrett. Planted out in tonnage experiments only in fall of 1925, hence there are no data as to its behavior in Porto Rico.

Erect, at length recumbent, good vigor. Stalks long, medium girth, green, through yellowish brown to red, with light colored, wavy striations on upper halves of internodes. Internodes long, cylindrical, very slightly staggered, furrow long, broad and shallow. Nodes slightly constricted, oblique; growth ring narrow and prominent, light green to reddish brown; root band medium width, parallel, green; rudimentary roots large, conspicuous, few and scattered, red; leaf scar glabrate, broad and prominent in front and appressed behind; glaucous band constricted, broad and conspicuous. Bud large,  $10 \times 12$  mm., exceeding growth ring by one-third to one-half, ovate, germination apical, margin broad, flat and on upper half only, distinct lannation along fibro-vascular bundles of buds, no apical tufts, heavy basal plaes. Leaf sheaths lannate dorsally, sides glabrate, glaucous, slightly tinted; inner base green; throat broad and well defined, brownish, glabrate; collar broad and reaching midrib, glaucous; ligule narrow at sides; short stubby ligular process on one side only. Leaf blades spreading with declining tips, dark, green, broad, 8-10 cms., margins uniformly and minutely serrulated to base, sparse basal ciliation.

## REFERENCES

BOVELL J. R. & D'ALBUQUERQUE, J. P.—Rept. on the Sugar-Cane  
 Expts. for the Season between 1920-22. Barbados Dept. Agr.  
*Idem.*—1921-1923.

**B-156.**

Introduced from Antigua in 1909 by Mr. Sewall. He notes that it was easy to establish and was rich in sugar but not heavy in tonnage. It does not seem to have been planted elsewhere. Not seen.

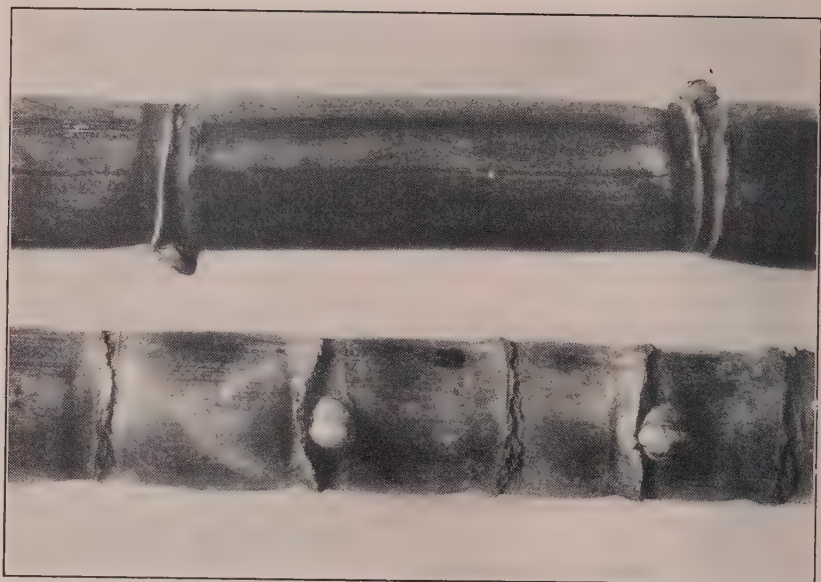
\* **B-208.** See Plate I, opposite page 85; also Plate VII, opposite page 95.

Parentage unknown. Introduced from Antigua by Sewall in 1909,

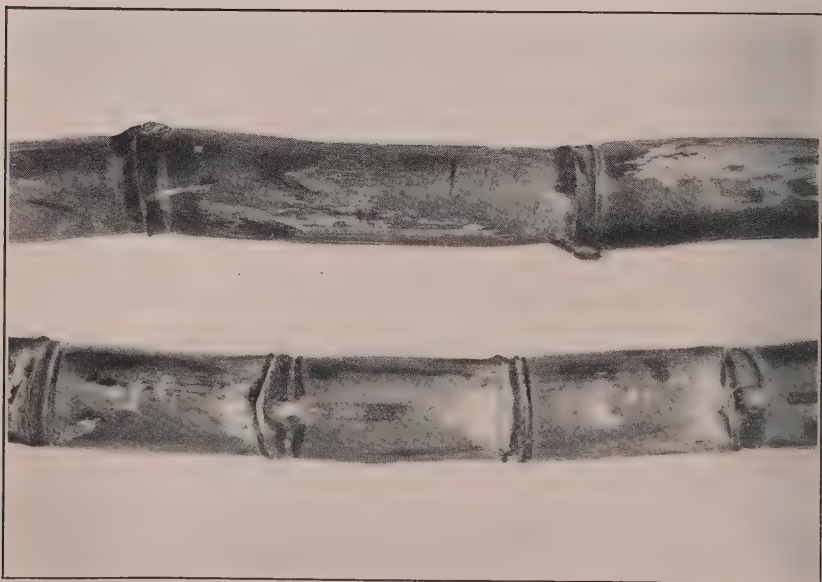




B 208



B 306



but he notes that it had been previously grown at Mayagüez. A large field of it in good condition was noted at Central Fortuna by Mr. Crawley in August, 1910. Included by Murphy in a list of best canes from Guánica, December, 28, 1910. Mentioned by McConnie among the best canes for Fajardo, June 24, 1913. Frequently seen in all parts of the Island but particularly on the south and east coasts, where considerable fields of it are still cultivated.

Erect or at length declined, vigorous, medium stooling, seldom arrows. Stalks medium length, medium stout to stout, green, usually no flush, somewhat glaucous. Internodes short, tumid, usually abruptly enlarged below at the back, furrow evident but shallow. Nodes narrow, strongly constricted; growth ring narrow, at first yellow then concolorous and inconspicuous; root band narrow, oblique 5 to 8 mm., leaf scar glabrous; glaucous band narrow, strongly constricted, well defined. Buds subhemispheric but broader than long, about  $12 \times 10$  mm., not exceeding the growth ring, margin narrow but distinctly shouldered, germination subdorsal, soon developing on the standing stalk, with a scanty apical tuft of long hairs. Leaf sheaths with a dense vestiture of long erect pallid hairs, green or somewhat tinted, rather glaucous, stained with purple at base within; throat lannate, and with an abundant vestiture of long hairs; collar conspicuous, reaching the midrib, the center densely glaucous, the margins lannate with short white hairs; ligule medium width, about 3 mm., edge fimbriate; ligular processes usually none. Leaf blades, semi-erect, not numerous, broad, reaching 8 to 9 cm., rather short and abruptly pointed, sharply serrulate, the base a little ciliate.

This was the first of the Barbados seedlings to attract wide-spread attention. It has been carried all over the world and has been tested wherever cane is grown on a commercial scale. At times it gives splendid results both in tonnage and sucrose, but its behavior has been too uneven to be fully satisfactory. It is by no means a general-purpose cane, being confined to a rather narrow range of soil conditions. It requires a rich, moist but porous and well-drained soil. In fact its requirements are much the same as those of the Otaheite but it is even more intolerant of drouth. In Porto Rico it does well on semi-*poysals* and alluvial *vegas*, especially where irrigation is available. In such localities it ratoons much better than Otaheite and it is to be strongly recommended, especially for late spring planting, since it matures fairly early. It is not adapted to hard, dry, exhausted soils.

On suitable soils it is fairly resistant to root disease, as shown by its good ratooning power, but it is very susceptible to mosaic,

taking the disease easily and suffering seriously when attacked. It is, too, somewhat susceptible to the gum disease and should not be planted where that is prevalent.

Its great reputation for unusual sweetness is hardly sustained by our records. With all of the conditions fully favorable it will doubtless sometimes exceed Cristalina in the per cent of sucrose, but as seen from the following selected analyses it frequently falls below that standard kind when taken under comparable conditions:

Kind	Date	Age	Extr.	Brix	Sucr.	R. S.	Purity	Fiber
B-208.....	Feb. 1912	Pl. ....	.....	17.1	13.9	1.2	81.3	.....
B-208.....	Feb. 1913	Rat. ....	.....	19.95	18.68	.....	93.6	.....
B-208 (1).....	2-12-13	Pl. ....	.....	17.3	14.71	.....	85.02	.....
B-208 (2).....	1-5-20	Rat. 14 mo. ....	66.4	18.98	16.99	.....	89.50	.....
B-208.....	12-6-20	Rat. 13 mo. ....	62.7	16.0	12.07	1.99	84.66	10.27
Average of 5 Canes.....	12-6-20	Rat. 13 mo. ....	.....	.....	13.69	1.67	85.88	12.29
B-208.....	12-15-20	Rat. 14 mo. ....	70.1	18.15	15.87	0.89	87.43	9.56
Cristalina.....	12-15-20	Rat. 14 mo. ....	70.0	17.50	15.33	0.28	87.50	9.68
B-208.....	1-24-21	Rat. 15 mo. ....	62.9	17.70	15.05	0.85	87.50	11.85
Cristalina.....	1-24-21	Rat. 15 mo. ....	70.3	17.85	16.14	0.33	90.42	10.69
B-208.....	2-9-21	Pl. 16 mo. ....	64.0	13.00	15.73	1.03	87.22	11.52
Cristalina.....	2-9-21	Pl. 16 mo. ....	68.7	16.20	13.85	0.95	88.49	11.20
B-208 (3).....	Apr. 1913	Pl. ....	.....	.....	18.08	.....	93.6	.....
B-208 (4).....	3-18-11	(Sewall Naguabo).....	.....	22.40	22.0	.....	98.20	.....
B-208.....	Mar. 1912	(Guánica Reports).....	.....	18.6	15.7	.....	81.9	.....
Otaheite.....	Mar. 1912	(Guánica Reports).....	.....	17.3	14.3	.....	79.7	.....
B-208.....	Mar. 1912	(Guánica Reports).....	.....	18.2	15.2	.....	81.4	.....
Otaheite.....	Mar. 1912	(Guánica Reports).....	.....	17.7	14.9	.....	82.2	.....
B-208.....	Mar. 1913	(Guánica Reports).....	.....	20.4	16.6	.....	81.4	.....
Otaheite.....	Mar. 1913	(Guánica Reports).....	.....	18.7	14.9	.....	79.8	.....
B-376.....	Mar. 1913	(Guánica Reports).....	.....	19.4	16.1	.....	82.8	.....
B-208.....	Feb. 1926	Ins. Sta. Tonnage Expt.	.....	12.58	16.09	Cane 34.44 Ins. ....	92.50	Sug. p. A. 4.22 Ton.
B H-10 (12).....	Feb. 1926	Ins. Sta. Tonnage Expt.	.....	17.43	15.00	Cane 54.81 Ins. ....	86.06	Sug. p. A. 6.05 Ton.

(1) Was seventh in sucrose in a lot of 30 kinds.

(2) Was fifth in sucrose out of 37 kinds. Cristalina average of 9 plots, 17.37 per cent; B-376, 18.18 per cent; B-1809, 17.42 per cent; PR-208, 17.54 per cent.

(3) Highest for the year in sucrose.—Cowgill.

(4) The highest analyses found in our records for any cane.

This once favorite variety seems in Porto Rico to have more than met its match in B.H. 10(12) and even at Mereedita de Ponce, its former stronghold, it has now been almost entirely replaced by its younger and more adaptable relative.

#### REFERENCES

- BLOUX, R. E.—Variedades de Caña. Rev. Ind. y Agr. de Tucumán, IV, 5:1913.
- ROSENFELD, ARTHUR H.—The B.H. 10(12) and S.C. 12/4 Canes in Porto Rico. Jour. of the P. R. Dept. Agr. IX, 3, pp. 215-47; July, 1925.

B-268.

Also brought from Barbados in November, 1924, by Mr. O. W.

Barrett. Planted out in tonnage experiments only in fall of 1925, hence there are no data as to its behavior in Porto Rico.

Recumbent, good vigor. Stalks long, good girth, yellowish green base overlaid with heavy violet bloom, red flush on exposure to sun. Internodes medium length, decidedly tumid and pronouncedly enlarged at base, staggered, furrow broad, shallow and well defined. Nodes very conspicuous and oblique; growth ring wide, even, brown changing to green; root band medium to wide, oblique, light green to concolorous; rudimentary roots inconspicuous, few and scattered, 3-4 in rows, purplish to brown; leaf scar glabrate, appressed behind; glaucous band inconspicuous, broad and deeply sunken. Buds large and flat,  $12 \times 16$  mms., exceeding growth ring by one-half, lanceolate, germination apical, margins narrow and glabrate, on upper two-thirds only, no apical tufts: light basal plaes. Leaf sheaths with extremely sparse dorsal vestiture, sides glabrate; glaucous, tinted, inner base green; throat broad and sparsely lannated, marginal tufts of long straggling hairs; collar wide, glaucous and reaching midrib; ligule medium width, convex at center, ligular process broad, 2-3 cms. long, on one side only. Leaf blades plicate with declining tips, medium width, about 6 cms., dark green, margins uniformly but very minutely serrulated, very sparse basal ciliation.

## REFERENCES

BOVELL, J. R. & D'ALBUQUERQUE, J. P.—Rept. on the Sugar-Cane Expts. for the Season between 1920-22. Barbados Dept. Agr.  
*Idem.*—1921-23.

**B-306.** See Plate VII, opposite page 95.

Introduced from Antigua in 1909 by Sewall, who remarks "already grown at Mayagüez as No. 347". It seems to have been grown on the Station grounds as B-306 up to 1913, since that date it has been called B-347. It has been impossible to determine which is really the correct name for this cane.<sup>1</sup>

\* **B-347.** See Plate VIII, opposite page 99.

Parentage unknown. Introduced from Audubon Park, Louisiana, by D. W. May in 1904. Reintroduced by Mr. Sewall (see above) as B-306. Frequently seen in mixed cultures, especially on the south and east coasts. It is occasionally found in the fields at Central Fortuna.

<sup>1</sup> Brief notes in Proc. Agric. Soc. Trinidad, Tob. 9: 108, 1909, indicate that B-306 is a yellow cane not unlike Otaheite while B-347 is called a dingy purple cane of heavy growth. If this is correct, our cane is B-306 and not B-347.



Erect or at length decumbent, good vigor, medium stooling, arrows occasionally. Stalks long, medium diameter, green, yellow on maturity, no flush, little or no bloom. Internodes medium to long, slightly flattened, strongly staggered, often marked with whitish blotches, furrow slight or sometimes none. Nodes slightly constricted; growth ring narrow slightly sunken, concolorous; root band strongly oblique, 6 to 10 mm., concolorous; rudimentary roots large but inconspicuous, concolorous, in about 3 rows; leaf scar at first conspicuously ciliate, later often glabrate, prominent, not appressed behind; glaucous band broad, well marked. Buds large, oval, obtuse, often reddish, 10 to 12  $\times$  15 mm., margin uniform rather wide, usually exceeding the growth ring, germination subapical, basal places and apical tuft and lines of hairs on the sides. Leaf sheaths with a dense vestiture of pallid hairs, green or very slightly tinted, somewhat glaucous, slightly stained, with purple at base within; throat dark brown, densely lannate and with a circle of short dark hairs behind the ligule; collar dark, rather broad, reaching the midrib, lannate; ligule medium width, about 3 mm., margin even; ligular processes none. Leaf blades numerous, somewhat two-ranked, strictly erect, plicate and revolute, bright green, 7 to 8 cm., wide, very minutely serrulate, the base even, not ciliate.

This is a thoroughly good, medium-season, general purpose cane. It perhaps has nothing to specifically recommend it in preference to Cristalina and Rayada, though on some soils it will certainly out-yield these kinds and will probably ratoon longer. It prefers moist rather than dry land. When immature it has less sugar than Cristalina in the same condition, but when fully ripe it is equally as good. It is a soft cane and is often badly damaged by rats. It may be planted either in fall or spring.

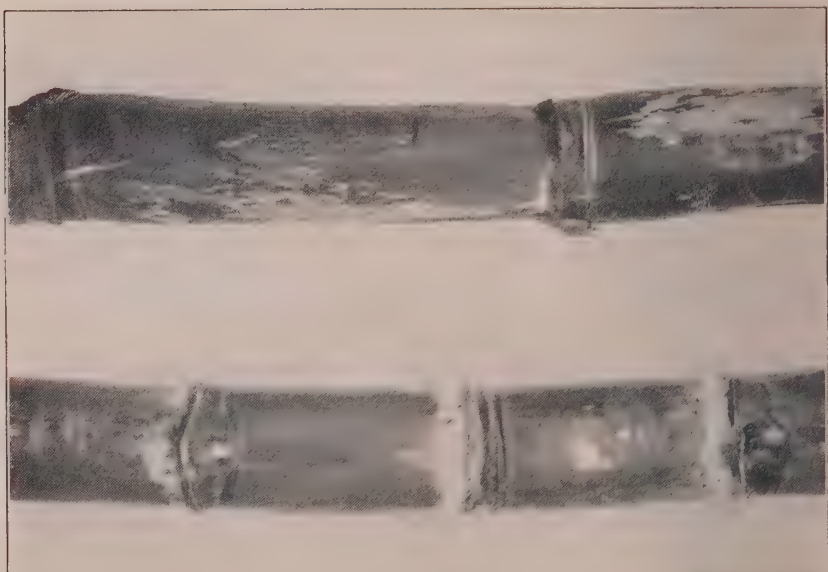
It resists root disease better than Cristalina. It is probably susceptible to mosaic but it was accidentally omitted from the immunity test at Santa Rita and we have no positive observations.

Neither has its reaction to gum disease been tested.

Kind	Date	Age	Arrows	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
B-347.....	12-28-20	Rat. 9 mo....	No....	74.06	14.89	12.03	2.12	80.77	8.12
B-347.....	12-28-20	Rat. 9 mo....	Yes....	72.7	17.09	14.81	1.49	86.65	8.73
B-347.....	12-10-20	Rat. 10 mo....	No....	71.7	18.93	10.37	2.93	74.44	7.77
Rayada.....	12-10-20	Rat. 10 mo....	No....	71.1	15.83	13.45	1.76	84.96	8.08
B-347.....	1-5-21	Pl. 15 mo....	No....	71.1	16.96	14.90	1.13	87.85	11.56
Cristalina.....	1-5-21	Pl. 15 mo....	No....	66.6	16.96	15.35	0.56	90.56	11.35
B-347.....	2-9-21	Pl. 16 mo....	No....	62.9	16.20	16.90	0.68	91.35	11.87
Cristalina.....	2-9-21	Pl. 16 mo....	No....	68.7	16.20	13.85	0.95	85.49	11.20
B-347.....	1-26-22	Rat. 15 mo....	No....	68.7	19.05	17.30	0.32	90.81	11.26
B-347.....	1-26-22	Rat. 15 mo....	Yes....	71.1	18.05	15.85	0.67	87.81	12.27
Cristalina.....	1-26-22	Rat. 15 mo....	No....	70.3	17.85	16.14	0.33	90.42	10.69







B 347



B 376

This cane was included in the Aguirre test plots in 1911 when it gave tons cane, 61.878; brix, 17.33; sucrose, 13.95; purity, 80.5; tons sugar, 6.08.

## REFERENCES

- COLÓN, E. D.—Varieties of Sugar Cane. Annl. Rept. of the P. R. Ins. Expt. Sta., 1917-18, pp. 22-4; San Juan, 1919.  
VEVE, R. A.—Our experience with Cane Varieties. Memoirs Assn. Sugar Technologists of P. R., 1, 1, pp. 28-31; June, 1922.

\* B-376. See Plate VIII, opposite page 99.

Parentage unknown. Seems to have been introduced by Mr. Murphy from Barbados. It is mentioned in his reports under date of November, 1910, and in October, 1911, he reports 10 to 12 acres of it under cultivation at Central Guánica. At Central Fajardo 91 acres of it were harvested in 1917, and 66 acres in 1919. Fortuna still has a few fields of this variety. The writer found scattered plantings of it in Peru in the spring of 1926. There it seemed more resistant to alkaline concentration than Cristalina, to which it is similar.

The description of Cristalina will fit this cane word for word except that in B-376 the collar is glaucous or very slightly lannate on the extreme margins while, in Cristalina it is lannate throughout.

In cultural characters also it is almost the exact equivalent of Cristalina, though usually seeming a little more vigorous and often giving rather heavier tonnage. In one of the Fajardo reports it is noted as doing well on salty *poysals*.

In its behavior toward root disease and mosaic it is exactly equal to Cristalina. Its reaction to gum disease has not been determined, but doubtless like Cristalina it will be more or less susceptible.

As seen from the following selected analyses, it is the equivalent of Cristalina as a sugar producer. In fact, for all practical purposes it may be considered as a rather unusually vigorous strain of that standard kind and as such it has a very considerable value.

Kind	Date	Age	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
B-376(1) .....	1-5-20	Rat. 15 mo....	68.0	20.05	18.18	.....	90.4	.....
B-376 .....	12-23-20	Rat. 9 mo....	68.0	16.33	14.67	1.64	88.1	8.98
B-376 .....	12-20-12	Rat. 14 mo....	70.5	16.43	14.67	0.85	89.4	10.58
B-376 .....	12-20-12	Rat. 14 mo....	70.0	17.60	15.53	0.28	88.2	9.60
Cristalina .....	1-26-21	Rat. 15 mo....	64.2	16.65	15.21	0.59	91.3	11.45
B-376 .....	1-26-21	Rat. 15 mo....	70.3	17.85	16.14	0.38	90.4	10.69
Cristalina .....	12-24-20	Pl. 15 mo....	63.6	18.48	17.0	0.37	91.9	10.19
B-376 .....	12-24-20	Pl. 15 mo....	65.7	18.88	17.08	0.52	90.6	13.72
Cristalina .....	2-7-21	Pl. 16 mo....	60.7	19.10	16.99	0.86	88.9	11.79
B-376 .....	2-7-21	Pl. 16 mo....	68.6	17.90	16.14	0.80	90.1	13.81
Cristalina .....	2-7-21	Pl. 16 mo....	68.6	17.90	16.14	0.80	90.1	13.81

(1) The highest in sucrose out of 37 kinds. Cristalina average, 3 plots, 17.27; high-  
est, 18.10.

## REFERENCES

- CRAWLEY, J. T.—Second Annual Report of the Experiment Station for the Year 1911-12. Sugar Producers' Assn. of Porto Rico; 1912.
- GOSSET, B. S.—Notes on the Sugar-Cane Experiments in British Guiana. Bull. of the Dept. of Agriculture of Jamaica, II, 7, New Ser., pp. 207-218; 1913.

**B-381.**

Obtained from Barbados in November, 1924, through courtesy of Hon. Jno. R. Bovell, Director of Agriculture, who produced the variety. Was planted out in tonnage experiments at the Station only in fall of 1925, hence there are no data on its behavior on this Island, although its general appearance in above-mentioned tonnage experiments is inferior to that of B.H. 10(12).

Erect, at length recumbent, good vigor, fine stooler. Stalks long and stout, green changing to uniform brownish yellow, numerous light vertical striations on upper halves of internodes, slight flush, no bloom, tendency to split. Internodes long, cylindrical, staggered, furrow trace to none. Nodes nearly even and parallel; growth ring broad and prominent brownish to concolorous; root band narrow; light green to concolorous; rudimentary roots small and crowded, 2-4 in rows, brownish; leaf scar glabrate, appressed behind; glaucous band broad and conspicuous, constricted. Buds medium size, and plump 7 / 9 mm., germination subapical, orbicular, margins in upper half only, narrow at sides and broadening to apex, purple, sparsely lannated, with very wide and heavy apical tufts, light basal plaes. Leaf sheaths with light dorsal vestiture, sides glabrate, glaucous, tinted, inner base lightly tinted; throat medium width, with dark waxy covering, no lannation except for a few coarse hairs at margins; collar narrow, reaching midrib, glaucous; ligule narrow and convex at center, ligular process none. Leaf blades spreading with declining tips, wide, 10-12 cms., dark green, uniformly and minutely serrulated and ciliated at margins.

## REFERENCES

- BOVELL, J. R., AND D'ALBUQUERQUE, J. P.—Rept. on the Sugar-Cane Expts. for the Season between 1919-21. Barbados Dept. Agr. *Idem.*—1920-22.

**B-417.**

Obtained from Barbados in November, 1924, through the courtesy of Director of Agriculture John R. Bovell, the producer of the variety, who wrote us on July 21st, 1925, in regard to this variety,

that it is "not only . . . a heavy yielder, but it contains juice of high sucrose content and is a drought resister." It was planted out in tonnage experiments in October, 1925, and has consistently maintained a better appearance and more vigorous growth than B.H. 10(12), the check in all these experiments.

Erect, good vigor. Stalks long and robust, yellowish green at first, changing to uniform reddish purple, with long, thin, yellow vertical striations, some bloom. Internodes long, cylindrical, not staggered, no furrow. Nodes nearly even, oblique; growth ring indistinct, narrow and slightly elevated, light green to concolorous, root band wide, oblique, light green to concolorous; rudimentary roots small and crowded, 5-6 in rows, purplish to concolorous, marked tendency to premature sprouting; leaf scar glabrate, appressed behind; glaucous band medium width, slightly constricted and very inconspicuous on older joints. Bud small, 6 x 8 mms., reaching growth ring, orbicular, germination subdorsal, margins broad and flat at sides, becoming convex at center, laminated along fibro-vascular bundles and margins, apparently deciduous apical tufts, heavy basal plates. Leaf sheaths with sparse dorsal vestiture of short, tawny hairs, sides glabrate, some wax, tinted, inner base green; throat wide, laminated, a few straggling hairs at margins; collar broad and well defined, reaching midrib, glaucous; ligule narrow except at center, nearly even, ligular process on one side only, short and stubby. Leaf blades spreading with declining tips, broad, 10-12 cms., dark green, minutely and uniformly serrulated and ciliated at margins.

#### REFERENCES

BOVELL, J. R., AND D'ALBUQUERQUE, J. P. Rept. on the Sugar-Cane Expts. between 1919-21.—Barbados Dept. Agriculture.  
*Idem*.—1920-22.

#### B-425.

Another of the canes imported from Barbados in November, 1924, and the one which has shown up about the poorest of this lot of fifteen varieties, being the one outstanding kind suffering severely from attacks of *Helminthosporium sacchari*. Planted out in tonnage experiments in October, 1925, there has been as yet no time to obtain definite data as to its yield and sugar content.

Erect, fairly vigorous. Stalks long and of good girth, yellowish green, some flush, no bloom. Internodes of medium length, rather cylindrical, distinctly staggered, furrow short and shallow to none. Nodes even oblique; growth ring conspicuous, medium width, elevated only at back opposite bud, concolorous; root band rather narrow,



oblique, concolorous; rudimentary roots large, few and scattered, 3-4 in rows, purplish brown, decided tendency to premature sprouting; leaf scar glabrate, appressed behind; glaucous band broad and fairly well defined, slightly constricted. Buds, medium size,  $8 \times 10$  mm., slightly exceeding growth ring, suborbicular germination subapical, margins broad and flat, abruptly shouldered at sides and peaked at apex, very few marginal hairs, no apical tufts, distinct basal plaes. Leaf sheaths with abundant dorsal vestiture of short, tawny, deciduous hairs, sides glabrate, slightly tinted glaucous, inner base also slightly tinted; throat broad and well defined, lannate, very short, appressed hairs, coarse, hairs at margins; collar broad and well defined, reaching midrib, glaucous; ligule very narrow and peaked at center, ligular process short and stubby, on one side only. Leaf blades spreading, with usually erect tips, medium width, 7-9 cms., very distinct and broad white midrib, margins minutely and uniformly serrulated, scanty basal ciliation.

## REFERENCES

- BOVELL, J. R., AND D'ALBUQUERQUE, J. P.—Rept. the Sugar Cane Expts. for the Season between 1919-21. Barbados Dept. Agriculture.
- ROSENFELD, ARTHUR H.—Rept. of Special Technologist for Cane. Annl. Rept. Ins. Expt. Sta. of Porto Rico, 1924-25.

\* B-1030. See Plate I, opposite page 85.

When imported and by whom unknown. There were  $27\frac{3}{4}$  acres of it at Central Mercedita, Ponce, in 1916, and it is still being grown there. It has also been grown on a small scale at Fajardo.

Soon decumbent, vigorous, a strong stooler, arrowing not noted. Stalks medium length and diameter, green with a dull, brownish-purple flush when exposed, a little bloom. Internodes medium length, somewhat barrel shaped, a little staggered, furrow none. Nodes constricted, oblique; growth ring rather wide, even, bright green, then concolorous; root band narrow, very oblique, 5 to 8 mm., concolorous; rudimentary roots inconspicuous, in 2 or 3 rows; leaf scar glabrous, appressed behind; glaucous band narrow, strongly constricted. Buds large, broadly ovate, obtuse, broader than long,  $12$  to  $14 \times 10$  to  $12$  mm., exceeding the growth ring, margin broad, shouldered, germination subdorsal, premature, the buds soon sprouting, vestiture scanty, indistinct basal plaes and an apical tuft. Leaf sheaths with dense vestiture of suberect tawney hairs, green or faintly tinted, glaucous; throat glaucous, with a few scattered medium long hairs; collar broad, pallid, glaucous or slightly lannate on the margins; ligule

medium length, fimbriate; ligular processes none. Leaf blades erect, two-ranked, flat, broad, 9 cm., glaucous-green, minutely serrulate, the base slightly ciliate.

This cane germinates quickly, grows vigorously and stools unusually well. It has not been sufficiently tested to express a final judgement as to its value, but it promises to be very useful on account of its early maturity. It had more sucrose than any cane analyzed during the first half of December. This is very important, for most of our heavy-tonnage canes are late in maturing and we are greatly in need of early kinds for grinding during the first part of the crop. Apparently this cane will serve also for late spring planting. Its greatest weakness seems to be its unusually strong tendency for the buds to sprout prematurely.

It was not included in the immunity experiment at Santa Rita. At Mercedita it is said to be about medium in its susceptibility to mosaic. It seems to ratoon well and promises to be fairly resistant to root disease. Its reaction to gum disease is not known.

Kind	Date	Age	Extr.	Brix	Sucr.	R. S.	Purity	Fiber
B-1030.....	12-6-20	Pl. 13 mo.	.....	17.88	15.10	1.53	84.88	9.98
Ave. of 5 Cheribon.....	12-6-20	Pl. 14 mo.	.....	.....	13.69	1.67	85.88	12.29
B-1030.....	3-9-21	Pl. 16 mo.	66.00	19.70	18.45	0.42	93.64	12.24
Cristalina ..	3-9-21	Pl. 16 mo.	69.40	19.09	17.20	0.39	90.52	11.01
B-1030.....	6-7-24	Pl. 11 mo.	.....	20.90	19.63	0.60	93.92	2nd of 14
BH 10 (12) ..	6-7-24	Pl. 11 mo.	.....	19.20	16.82	0.80	87.60	7th of 14
B-1030.....	3-2-25	Pl. 20 mo.	.....	17.90	16.13	1.03	20.10	5th of 17
BH-10 (12) ..	3-2-25	Pl. 20 mo.	.....	17.70	15.93	1.13	90.00	6th of 17
B-1030.....	5-14-26	Pl. 14 mo.	.....	21.40	20.57	0.17	96.16	1st of 12
BH-10 (12) ..	5-14-26	Pl. 14 mo.	T. Sug. per Ac.	18.65	16.80	0.33	89.12	9th of 12
B-1030.....	5-14-26	Pl. 14 mo.	3.43	.....	19.60	.....	91.80	1st of 9
BH-10 (12) ..	5-14-26	Pl. 14 mo.	2.92	.....	17.90	.....	89.36	4th of 9

The last four pairs of analyses are of cane from the Hatillo Fruit Farm, where B-1030, on the shaly hills of that property near the Station, has consistently given about the best results of any cane tried since Mr. Earle interested the manager, Mr. W. C. Dreier, in varieties in 1921. This first three sets are the results of extractions in the laboratory mill at the Station, but the last are of commercial quantities of cane ground at Central Victoria and are the basis on which payment was made for this cane. When any cane can so consistently do better than B.H.-10(12) under ANY CONDITIONS WHATSOEVER, it is well worthy of further trial. Tonnage experiments with this variety in comparison with all the other Barbados varieties mentioned in this study, are under way at the Station at present and Mr. Dreier is considerably extending the variety at the Hatillo Fruit Farm.

## REFERENCES

- ROSENFELD, ARTHUR H.—Estudios de Variedades. Informe Anual de la Estación Experimental Insular de Puerto Rico, Año Fiscal 1923-1924; pp. 69-72; San Juan, 1924.
- VEVE, RAFAEL A.—Our Experience with Cane Varieties. Memoirs of the Association of Sugar Technologists of Porto Rico, I, 1, pp. 28-31; June, 1922.

## \* B-1355.

Mr. Sewall received this cane from the Federal Station at Mayagüez, according to a note by Cowgill, but date is not given. It was growing at this Station in 1911 and 1913 from seed sent by Mr. Sewall, but had disappeared from the collections until seed was brought from Central Mercedita in September, 1919, by Mr. Earle. Over ninety acres of it were grown at that Central in 1916 and it has been grown to some extent at Fajardo, although it is at present little planted there.

Soon decumbent, good vigor and stooling, arrowing not noted, stalks long, medium diameter, green with dull red flush, no bloom. Internodes, medium length, somewhat staggered, abruptly shouldered below at back, furrow none. Nodes constricted; growth ring very broad, 4 to 6 mm., even but encircling the shoulder of the internode, concolorous but often bordered with reddish; root band narrow, oblique, sharply constricted; rudimentary roots obscure, in about 2 rows; leaf scar strongly ciliate with stiff hairs 5 to 6 mm. long, appressed behind; glaucous band narrow, about 6 mm., strongly constricted. Buds ovate triangular, acute,  $10 \times 10$  to  $12 \times 12$  mm., exceeding the growth ring, margin broad, somewhat shouldered, germination apical, vestiture scanty at apex and margin, basal places well developed. Leaf sheaths with medium vestiture of soft appressed hairs, greenish, glaucous; throat sparingly lannate with some long hairs on the margins; collar pallid, reaching the midrib, sparingly lannate; ligule rather broad, 5 mm., edge fimbriate; ligular processes usually poorly developed. Leaf blades spreading, flat, rather narrow, about 6 cm., light green, margin closely but minutely serrulate, the base ciliate.

This seems to be a cane of only medium value, but not enough is known regarding its characteristics to express a positive opinion.

In the immunity experiment at Santa Rita it made a slightly better showing as regards root disease than the Rayada but fell in the same class in susceptibility to mosaic. Its reaction to gum disease is not known.

Its recorded at the Station as published in Circular 8 was rather

low in total tonnage for the three crops, medium in sucrose and high in purity, the figures being, total tons, 3 crops, 56.75; brix, 16.81; average sucrose, 15.71; purity, 93.3. Recent analyses are as follows:

Kind	Date	Age	Extr.	Brix	Sucr.	R. S.	Purity	Fiber
B-1355.....	12-2-20	Pl. 13 mo.....	67.3	15.3	12.54	3.06	81.96	11.77
Average of 5 Cheribon	12-2-29	Pl. 13 mo.....			12.63	1.67	83.88	12.29
B-1355.....	3-9-21	Pl. 16 mo.....	72.4	18.4	17.32	0.396	93.62	12.44
Cristalina.....	3-9-21	Pl. 16 mo.....	69.4	19.4	17.29	0.39	90.52	11.61

## REFERENCES

COWGILL, H. B.—Distribución de Caña para Semilla. Estación Experimental Insular de Puerto Rico, Cir. 8; San Juan, 1917.

EARLE, F. S.—The Resistance of Cane Varieties to the Yellow Stripe or Mosaic Disease. *Ibid*, Bull. 19; 1919.

**B-1356.**

Noted by Cowgill as having been received by Mr. Sewall from the Mayagüez Station. It was in cultivation at this Station in 1911 from seed sent by Mr. Sewall, Cowgill noting that it is scarcely distinguishable from B-1355. Its record in Circular 8 is total tons in 3 crops, 49.86; brix, 17.86; sucrose, 17.01; purity, 95.2, being the highest purity in the 24 kinds but next to the lowest tonnage. Not seen.

**B-1376.**

Noted as received from the Mayagüez Station by Mr. Sewall, from whom seed came to this Station in 1911, Mr. Murphey reports on it at Guánica in 1911. Was planted at Central Lafayette in 1914. Cowgill says "seems to be identical with Cristalina in appearance." Its record at this Station as published in Circular 8 was plant cane 41.8 tons, total 3 crops, 67.6 tons, total 3 crops, 67.6 tons, brix, 18.59; sucrose, 18.20; purity, 94.8. The highest sucrose out of 24 kinds and next to the highest purity.

Not seen.

**B-1529.**

Introduced by Mr. Sewall from Antigua in 1911. Apparently never planted elsewhere.

Not seen.

**B-1566.**

This seems to have been introduced from Barbados by Mr. Murphey. It figures frequently in his reports from Guánica during 1911, 1912, and 1913 and seems to have attracted his very favorable attention. It is said to have decidedly outyielded Otaheite and to ratoon well and

be free from rot. There were four acres at Guánica in 1915. It does not seem to have been planted elsewhere.

Not seen.

\* B-1753. See Plate IX, opposite page 107.

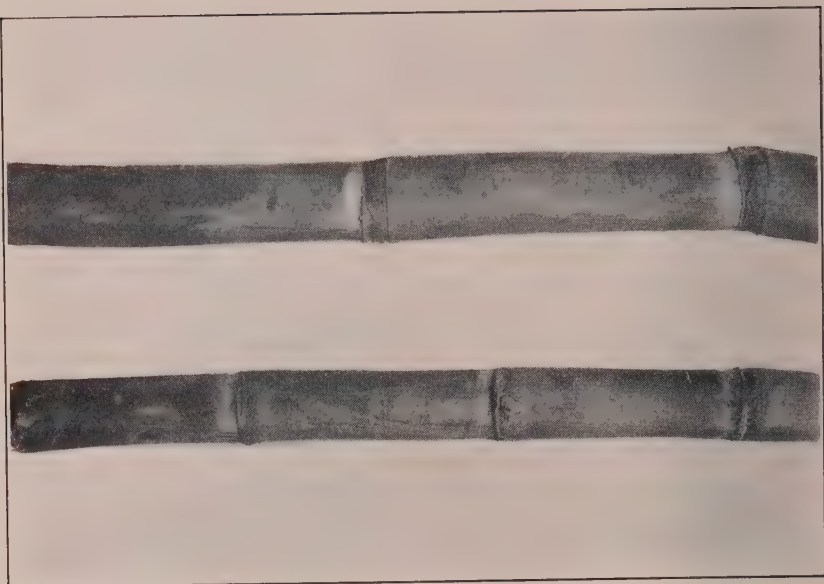
Noted by Mr. Sewall as received from the Mayagüez Station. Grown in considerable quantity at Guánica during 1910-1913, where it is frequently mentioned in Mr. Murphey's reports. He considered it as a very promising kind and frequently called attention to the fact that it is strongly resistant to lime chlorosis. There were 81 acres of it at Guánica in 1915, but it is no longer cultivated there. It was included in the variety experiment at Aguirre in 1911 and was grown at Central Lafayette in 1914-1916. It was formerly considerably cultivated at this Station, seed having been brought from Guánica in 1911, and although it produced the highest sugar per acre out of 24 kinds in the three-year tests reported in Circular 8 it is no longer found here and the recent attempts to bring in seed and reestablish it have failed, on account of its remarkably poor germination. Mr. Dreier, at the Hatillo Fruit Farm near the Station, has also obtained the poorest sort of germination from this variety.

Strictly erect, vigorous, a strong stooler, once germinated arrowing not noted. Stalks slender,  $2\frac{1}{2}$  to 3 cm., green, yellow when mature, no flush and no bloom. Internodes medium long, straight, cylindrical, furrow usually evident but slight. Nodes scarcely constricted; growth ring narrow, inconspicuous, concolorous; root band narrow, 6 to 8 mm., yellow; rudimentary roots small, indistinct, in 3 to 4 rows; leaf scar glabrous; glaucous band narrow, 6 to 7 mm., conspicuous. Buds rather small, oval-ovate, with rounded narrowed base and acute point, about  $8 \times 10$  mm., exceeds the growth ring, margin very narrow, germination apical, base sides and apex with appressed hairs. Leaf sheaths subglabrate but with short brown hairs mixed with the bloom, glaucous. Leaf blades erect, narrow, light green.

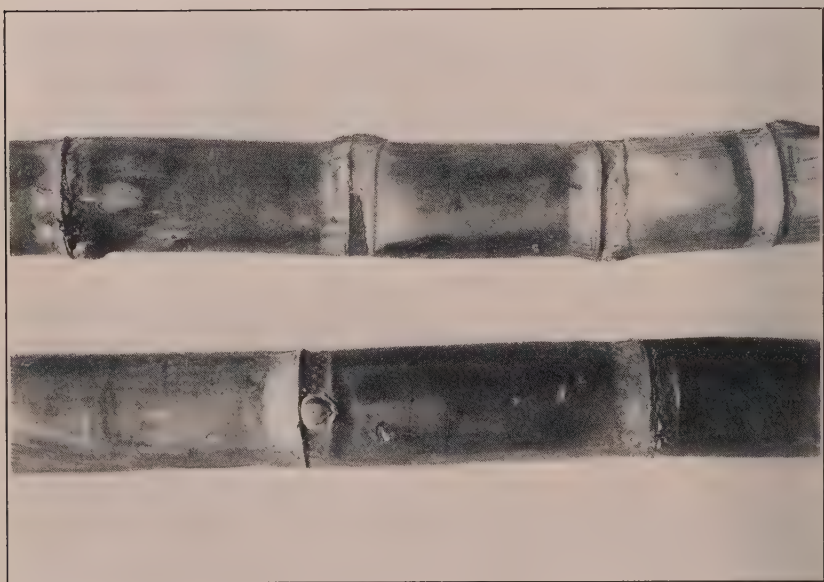
This is an unusual cane and one clearly having many excellent qualities. Earle considers it to have been dropped from cultivation solely because of its slender diameter, most planters having a strong but unfounded preference for stout canes, but the writer is inclined to think that its poor germination has had an influence. In the Aguirre plots in 1911 this kind gave tons cane, 59.165; brix, 17.97; sucrose, 13.80; purity, 79.8; tons sugar, 5.6. At Central Lafayette in 1914 as plant cane it gave, brix 21.0; sucrose, 18.5; purity, 88.3. Cane grown at La Muda, between Río Piedras and Caguas, analyzed







B 1753



B 3289

April, 1917, as plant cane at 14 months, gave, brix, 21.05; sucrose, 19.40; purity, 92.40. It was the highest in tonnage out of six kinds. Its record at the Station as published in Circular 8 is plant cane, 50.22 tons; total, 3 crops, 105.72 tons; average brix, 17.42; sucrose, 15.58; purity, 89.4. It was exceeded in tonnage by D-625, Cavengerie, Sealy Seedling, and B-4596, but figured by the formula now used by Central Vannina in buying cane by sucrose content this gave the highest sugar per acre of any of the 24 kinds tested, averaging 4.09 tons sugar per acre for each of the three crops.

It was not included in the immunity experiment at Santa Rita. At Central Mercedita it is reported to be very seldom attacked by mosaic. Its ratooning power shows it to be fairly resistant to root disease. It has not been tested with gum disease. Its unusual resistance to lime chlorosis has already been noted.

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- COWGILL, H. B.—Distribución de Caña para Semilla. Est. Exptl. Ins. de Puerto Rico, Cir. 8; 1917.
- ROSENFELD, ARTHUR H.—Lista de las Variedades de Caña de Azúcar bajo Experimentación. Informe del Comisionado de Agricultura y Trabajo de Puerto Rico, 1923-24, pp. 146-7; San Juan, 1924.

\* B-1809. See Plate II, opposite page 119.

Parentage unknown. Introduced by this Station from Barbados in 1911. It is now in cultivation at various points on the Island on a small scale, in many cases mixed with D-117, which it considerably resembles.

Strictly erect, good vigor, medium stooling, seldom arrows. Stalks long, medium to medium stout, green, a slight reddish flush when fully exposed, only light bloom. Internodes rather long a little flattened, usually abruptly shouldered below on side opposite to bud, furrow broad and rather deep. Nodes prominent, not constricted; growth ring broad, prominently enlarged; root band prominent, enlarged above to meet the swollen growth ring; rudimentary roots in 2 or 3 rows; leaf scar glabrous; glaucous band slightly constricted, well defined. Buds large, triangular-lanceolate, acute, 12 to 15 × 15 to 20 mm., exceeding the growth ring by one-half the length, margin narrow but shouldered; germination apical, apex bearded. Leaf sheaths with a scanty vestiture on the back which is soon deciduous becoming glabrate, green, glaucous; throat lannate and with a medium vestiture of hairs; collar broad, dark brown, reaching the midrib, glaucous, the margins sparingly lannate; ligule medium length, edge even; ligular processes none, or poorly developed. Leaf blades erect

except the tips, medium width, 6 to 7 cm., bright green, minutely but closely serrulate to the base.

This is a good, heavy-tonnage, general-purpose cane which matures fairly early. It may be safely planted as "Primavera". It is best adapted to "vega" lands, but also grows well in the red shale hills. In 1915 it stood second in tonnage out of 20 kinds at this Station, giving 9 tons more than Cristalina.

It was not included in the immunity experiment at Santa Rita but it has contracted mosaic on the Station grounds, being apparently in about the same class in regard to resistance as Rayada and Cristalina. Its reaction to gum disease is not known.

As seen from the following selected analyses, it is of about the same sucrose value as Cristalina:

Kind	Date	Age	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
B-1809 (1) .....	1915	Pl. ....	.....	17.34	15.48	.....	89.8	.....
Cristalina .....	1915	Pl. ....	.....	17.98	16.55	.....	92.0	.....
B-1809 .....	May, 1916	Rat. ....	.....	18.50	17.2	.....	92.98	.....
Cristalina .....	May, 1916	Rat. ....	.....	18.80	17.8	.....	94.14	.....
B-1809 .....	1-8-20	Rat. 14 mo.	68.2	19.15	17.52	.....	90.96	.....
B-1809 .....	12-13-20	Rat. 10 mo.	69.4	17.36	14.61	1.90	84.0	12.24
Rayada .....	12-13-20	Rat. 10 mo.	71.1	15.83	13.45	1.76	84.96	8.08
B-1809 .....	12-15-20	Rat. 14 mo.	70.8	16.63	14.23	2.02	85.56	11.68
Cristalina .....	12-15-20	Rat. 14 mo.	70.0	17.50	15.53	0.28	88.74	9.60
B-1809 .....	2-2-21	Rat. 16 mo.	66.6	18.35	16.92	0.31	92.2	12.69
Cristalina .....	2-2-21	Rat. 16 mo.	70.3	17.85	16.15	0.33	90.42	10.69
B-1809 .....	4-11-21	Pl. 17 mo.	64.50	18.80	17.40	0.581	92.55	11.52
Cristalina .....	4-11-21	Pl. 17 mo.	70.10	18.10	16.92	0.265	92.48	10.47
B-1809 .....	Jan. 1925	Pl. 17 mo.	Aguirre	17.60	16.09	.....	85.70	Ton. Sur. per acre 7.78
B-1809 .....	Jan. 1925	Pl. 17 mo.	Aguirre	17.20	14.68	.....	85.30	Ton. Sur. per acre 6.91
B-1809 .....	Jan. 1925	Pl. 17 mo.	Aguirre	17.15	14.48	.....	84.10	Ton. Sur. per acre 6.44

(1) Fourth in sucrose out of 37 kinds. Cristalina average, 3 plots, sucrose, 17.27; highest, 18.18; P.R.-208, 17.59; B-376, 18.18.

The Aguirre showing is certainly excellent and, with promising results at the Hatillo Fruit Farm obtained by Mr. Dreier, who is a careful observer, as well as most of the small plants showing up well wherever seen over the Island, it is evident that this old cane is worthy of much further detailed study. We have it in tonnage experiments with practically all of the other Barbados seedlings we have, few of which have ever been carried through actual tonnage tests here before.

#### REFERENCES

- ROSENFELD, ARTHUR H.—Annual Report for the Year 1923-24. 14th Ann. Rept. of P. R. Ins. Sta., 1923-24, pp. 62-8.
- VEVE, RAFAEL A.—Our Experience with Cane Varieties, Memoirs Assn. Sug. Tech. of P. R., I, 1, pp. 28-31; June, 1922.

**B-3289.** See Plate IX, opposite page 107.

Noted by Mr. Sewall that the seed came from the Mayagüez Station. Grown at this Station during 1912 and 1913 from seed received from Mr. Sewall. It was grown in a small way at Fajardo up to 1917, but its record there was poor, being twenty-second in tons sugar per acre out of 25 kinds. It was lowest in tons sugar per acre among the kinds tested at Aguirre in 1911, where its record was as follows: Tons cane, 59.702; brix, 16.47; sucrose, 12.89; purity, 78.3; tons sugar, 5.34. At this Station in 1913 it gave, tons cane, 34.05; sucrose, 16.58; purity, 89.9.

Not seen.

#### REFERENCES

VEVE, RAFAEL A.—Our Experience with Cane Varieties. Memoirs of the Assn. of Sugar Technologists of Porto Rico, I, 1, pp. 28-31; 1922.

WATTS, FRANCIS.—Sugar-Cane Experiments in the Leeward Islands. Pt. I, Experiments with Varieties of Cane, 1919-20. Issued by the Comm. of Agriculture for the West Indies; 1921.

\* **B-3390.**

Said to be a seedling of D-95. Probably introduced from Barbados by Mr. Murphey. At least he reports on it as in cultivation at Guánica in 1911, at which date seed was brought to this Station from there. It was at Fajardo as early as 1914. Brought to this Station from Fajardo in November, 1919.

Soon prostrate, medium vigor and stooling, arrows freely. Stalks long, medium slender, dull green with red flush, light bloom. Internodes long, somewhat enlarged below, straight or nearly so, furrow evident but shallow. Nodes scarcely constricted, oblique, growth ring broad, 3 to 5 mm., nearly even, bright green; root band strongly oblique, concolorous, rudimentary; roots rather crowded, in 3 or sometimes 4 rows; leaf scar glabrous, closely appressed behind; glaucous band narrow, somewhat constricted. Buds triangular-lanceolate, very long, 10 to 11  $\times$  15 to 20 mm., exceeding the growth ring by half or more of the length, margin medium, shouldered below, germination apical; basal plaes and scanty vestiture on sides and apex. Leaf sheaths glabrous, green scarcely glaucous; throat broad, densely lannate, very few long hairs; collar broad reaching the midrib, lannate; ligule very narrow, about 2 mm., somewhat fimbriate; ligular processes none. Leaf blades spreading, somewhat plicate rather narrow, about 6 cm., light green very sparingly serrulate nearly even, base not ciliate.

But little is known as to the agricultural value of this cane. It



has a good record on red lands in Barbados. In Antigua in 1919-20 it ranked 39th in production of sugar per acre out of 50 varieties tried—rather low!

It was included in the immunity experiment at Santa Rita but was in the small list that failed to contract the mosaic. Nothing is known as to its resistance to any of our three serious diseases.

The only available analyses are the following:

Kind	Date	Age	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
B-3390 .....	1915 .....	.....	.....	18.0	16.45	.....	91.5	.....
Cristalina .....	1915 .....	.....	.....	17.98	16.55	.....	92.0	.....
B-3390 .....	May, 1916 .....	Rat. ....	.....	18.4	17.2	.....	93.47	.....
B-3390 .....	1-14-21 .....	P1. 14 mo. ....	60.6	15.10	12.05	1.69	79.80	12.60
Cristalina .....	1-14-21 .....	P1. 15 mo. ....	70.0	17.25	15.96	0.37	92.52	9.60
B-3390 .....	4-8-21 .....	P1. 17 mo. ....	69.7	18.30	16.18	0.653	88.41	10.90

#### REFERENCES

- EARLE, F. S.—The Resistance of Cane Varieties to the Yellow Stripe or Mosaic Disease. P. R. Ins. Expt. Sta. Bull. 19; 1919.  
 WATTS, FRANCIS.—Sugar-Cane Experiments in the Leeward Islands. Pt. I, Expts. with Varieties of Sugar Cane. Comm. of Agr. for the W. I., 1921.

B-3405. See Plate X, opposite page 111.

A seedling of D-74. Probably introduced by Mr. Murphey from Barbados. It is mentioned in his Guánica reports for 1911. It first came to this Station from Guánica in 1911. It was reported from Fajardo in 1913. The first record at this Station is in 1911. Seed cane has been distributed to planters in many parts of the Island.

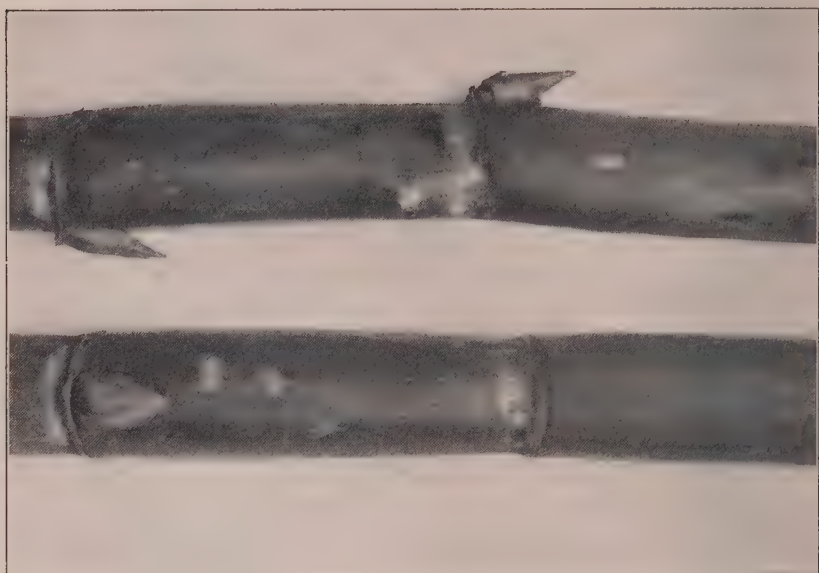
The description given under Sealey Seedlings fits this cane in every particular except that the collar is lannate while in the former it is glaucous or only slightly lannate on the extreme margins. This cane is also usually a little stouter and the leaves average a little broader, but these differences can hardly be exactly defined.<sup>1</sup>

This is a vigorous cane of heavy tonnage and is an especially strong ratooner. It is adapted to either high or low lands. It can be safely recommended for general planting on lands where Rayada and Cristalina are beginning to fail. It is, however, rather late in

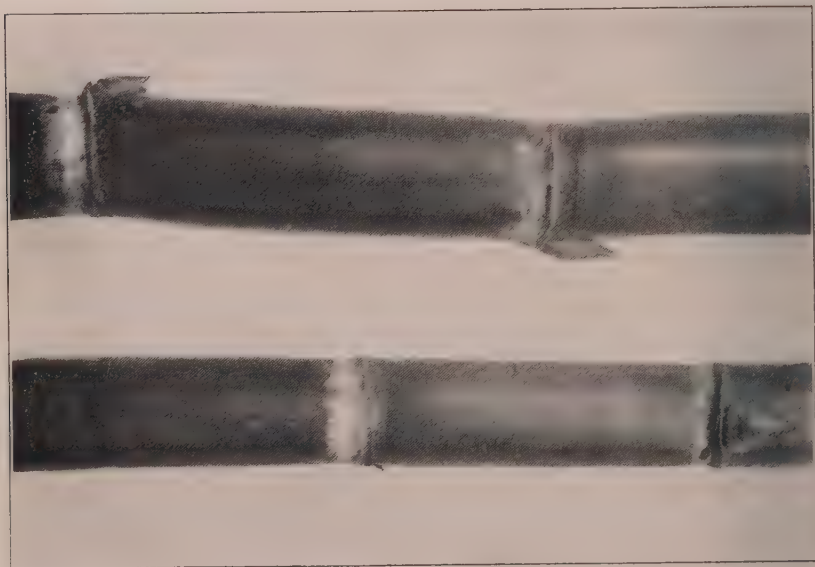
<sup>1</sup> From brief description of Sealey Seedling, B-3405 and B-3412 recently published in Rept. Imp. Dept. of Agric. West Indies, Sugar Cane Experiment in Leeward Islands, Antigua and St. Kitts—Nevis, 1918-19 (issued 1921) pp. 4-5, it seems probable that all of the material we have here in Porto Rico under these three names really belongs under B-3412. That is described as "erect, narrow, light-green leaves, medium-sized cane, slightly zig-zag. Internodes cylindrical, fairly long and slender, well-defined channel. Color greenish brown. Buds conical, long and pointed. Arrows sparsely." This fits our cane in every particular. Sealey seedling differs in color, being brownish green to brownish yellow, and in arrowing very freely. B-3405 is described as a russet-brown cane with broad, flat, adhering buds. We have no cane in Porto Rico which fits this description.



B 3405



B 3412



maturing and should be planted in the fall as "gran cultura", or if planted in the late spring it should be held over until the second year. If cut too green this cane is very poor in sugar, but when fully matured it develops a very satisfactory percentage of sucrose and purity.

It is quite resistant to root disease, as shown by its great ratooning power. It was not included in the immunity experiment at Santa Rita, so its behavior toward mosaic has not been fully tested. Some plots at Central Coloso of what was believed to be this cane were showing rather unusual resistance to it, but some plantings near Río Piedras are suffering severely from it. Its reaction to gum disease has not been determined.

A few selected analyses follow:

Kind	Date	Age	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
B-3405	1915	Pl.		17.17	15.19		88.4	
Cristalina	1915	Pl.		17.98	16.55		92.0	
B-3405	May, 1916	Rat.		18.6	17.1		91.93	
Cristalina	May, 1916	Rat.		18.8	17.8		94.14	
B-3405	12-8-20	Rat. 10 mo.	77.0	18.21	9.17	3.27	68.66	10.12
Cristalina	12-8-20	Rat. 10 mo.	73.0	15.63	13.41	1.78	85.76	10.80
B-3405	12-12-20	Rat. 14 mo.	70.9m	15.13	12.15	2.36	80.30	9.32
Cristalina	12-12-20	Rat. 14 mo.	70.0	17.50	15.53	0.28	88.74	9.60
B-3405	2-2-21	Rat. 16 mo.	65.7	17.10	15.17	0.988	88.12	12.37
Cristalina	2-2-21	Rat. 16 mo.	70.3	17.85	16.84	0.33	90.42	10.69
B-3405	4-12-21	Pl. 18	70.4	18.70	17.73	0.533	91.60	11.84
B-3405	5-14-26	Pl. 14	Hatillo Fruit	18.10	16.20	0.150	91.01	
B H-10 (12)	5-14-26	Pl. 14	Hatillo Fruit	18.85	16.80	0.350	89.12	

\* Third in tonnage both as plant and ratoon out of 20 kinds.

#### OTHER REFERENCES

ROSENFELD, ARTHUR H.—Informe del Tecnólogo Especial para Cañas. Inf. Anual del Comisionado de Agricultura y Trabajo de Pto. Rico, 1923-24, pp. 143-51; San Juan, 1924.

WATTS, FRANCIS.—Sugar-Cane Experiments in the Leeward Islands. 1919-20. Pt. I, Expts. with Varieties. Issued by the Comm. of Agr.

B-3412. See Plate X, opposite page 111.

Seedling of D-74. Presumably introduced from Barbados by Mr. Murphey. It figures prominently in his Guánica reports for 1910, 1911 and 1912, being at one time one of the principal canes planted there, especially on hill lands. Seed was brought to this Station from Guánica in 1911. It has also been largely planted at Fajardo, but is practically abandoned there now, as it was considered too low in sugar. It is to be seen in all parts of the Island and is probably more widely planted than any of the other Barbados seedlings, except BH 10(12).

For description see Sealey Seedling (and note under B-3405), from which it can be distinguished, if at all, only by the less lannate throat. It perhaps averages a little stouter than the form we have as Sealey Seedling, but it varies greatly in diameter according to vigor and condition of growth.

In agricultural value it seems to resemble B-3405 and Sealey Seedling as closely as in taxonomic characters. It has been much more widely planted than either of them, especially at Central Guánica, but it is hard to see on what grounds it can be separated from them. It grows best on low, moist lands, but in such localities it is difficult to ripen it enough to develop much sucrose. It is, therefore, usually planted as a hill-land cane. It is to be recommended for lands where Rayada and Cristalina fail, but great care should be taken not to cut it green. When really mature it makes a good yield of sugar and it can be depended on for better tonnage than Cristalina.

This kind has good resistance to root disease and always ratoons well. It is usually considerably troubled with leaf spot, sometimes enough so to interfere with growth, especially when young. It is noted in some of the Guánica reports that it resists the lime chlorosis as well as B-1753. Its behavior toward mosaic is peculiar in that it takes the disease less readily than some other kinds, but when once attacked it suffers severely, turning quite yellow and being conspicuously dwarfed. Its reaction to gum disease has not been determined.

The following analyses indicate how poor it is in sugar when green but that it sweetens up well at full maturity.

Kind	Date	Age	B. & W.	Brix	Sugar	B. & W.	Brix	Fiber
B-3412	4-17-17	Pl. 14 mo.	.....	22.42	12.35	.....	36.77	.....
B-3412	2-12-18	Pl. 16 mo.	.....	15.50	12.64	.....	80.30	.....
B-3412	12-15-20	Rat. 14 mo.	73.40	12.51	8.30	3.42	66.34	10.50
Cristalina	12-15-20	Rat. 14 mo.	76.9	17.56	15.52	2.22	82.77	8.49
B-3412	1-22-21	Rat. 15 mo.	70.8	14.15	10.74	2.006	70.99	11.06
Cristalina	1-25-21	Rat. 15 mo.	70.3	17.65	16.14	0.33	90.42	10.69
B-3412	4-11-21	Pl. 16 mo.	71.2	17.70	16.02	0.53	90.55	12.67
B-3412	2-7-21	Pl. 16 mo.	72.1	16.90	14.64	1.20	87.27	10.37
Cristalina	2-7-21	Pl. 16 mo.	68.6	17.90	16.14	0.802	90.16	12.01
B-3412	1-24-23	Pl. 13 mo.	Aguirre	17.90	12.96	.....	72.40	.....
B-3412	2-23-23	Pl. 14 mo.	Aguirre	19.20	15.02	.....	77.90	.....
B-3412	3-22-23	Pl. 15 mo.	Aguirre	18.60	15.72	.....	84.60	.....
B-3412	4-21-23	Pl. 16 mo.	Aguirre	25.45	18.05	.....	88.20	.....
B-3412	5-15-23	Rat. 12 mo.	Ins. Sta.	20.20	18.72	.....	92.67	.....
B-3412 (12)	5-15-23	Rat. 12 mo.	Ins. Sta.	19.60	18.84	.....	94.67	.....
			Tns. cane		T. sug. p. a			
B-3412	3-21-24	Pl. 22 mo.	Hatillo	38.14	16.63	4.56	86.20	.....
B-3412	2-21-24	Pl. 22 mo.	Hatillo	6.55	16.67	0.80	88.20	.....
B-3412	2-27-26	Rat. 12 mo.	Ins. Sta.	21.04	12.72	.....	79.25	.....
H-175	2-27-26	Rat. 12 mo.	Ins. Sta.	25.00	16.70	.....	88.10	.....



Of the Aguirre tests, Mr. Earle wrote in his records:

"As usual, late in maturity, but has made heavy tonnage and has kept in the field among the best. One of the few that would hold over to next crop without injury."

Mr. Dreier at the Hatillo Fruit Farm has frequently run this cane as "*caña quedada*" with most excellent results.

Properly handled, as Earle has so frequently indicated, this cane can occupy a decidedly useful place in our scheme of hillside plantings. The writer knows of very few types of its general hardiness which, once they have attained a reasonable purity, hold their condition over long periods as will this variety.

#### REFERENCES

COWGILL, H. B.—A method of Identification and Description of Sugar Cane Varieties and its Application to Types Grown in Porto Rico. The Journal of the Dept. of Agr. of Porto Rico, I, 3, pp. 118-40; July, 1917.

WATTS, FRANCIS.—Sugar-Cane Experiments in the Leeward Islands, Antigua and St. Kitts-Nevis. 1918-19, pp. 4-5; Imperial Dept. of Agriculture for the West Indies, 1921.

**B-3578.**

No data as to introduction. It was included among the canes sent from Fajardo for the immunity test at Santa Rita. Seed was also brought to this Station from Fajardo in November, 1919. There is no other record of its occurrence in the Island.

It is so little cultivated that a description is omitted.

It failed to contract the mosaic in the Santa Rita Experiment. It seemed to resist root disease unusually well and came through to the end of the experiment in good general condition and vigor.

**B-3675.**

Mentioned in Mr. Murphey's notes from Guánica in 1912. It seems to have been in cultivation at this Station in 1913, but the record is not clear.

Not seen.

**\* B-3696.**

Mr. Sewall's notes show that he obtained seed of this kind from the Federal Station at Mayagüez. Seed from him was planted at this Station in 1911. It does not seem to have been grown at Guánica, but was included in the variety test at Aguirre in 1911. It is grown on a small scale only at Fajardo. Seed was again brought to this Station in November, 1919, this time from Fajardo. This is

now the principal cane planted on the farm of the Hatillo Fruit Company, near Río Piedras. Some seed was obtained by them at this Station some years ago that was labeled B-3747. As it seemed to give good results the planting was extended from time to time and it was not noted until the spring of 1920 that two kinds of cane were represented. The greater part was of this kind as described below, but a small portion was clearly different, having a conspicuously ciliate leaf scar. This temporarily led to further confusion, as from this character it was carelessly considered to be B-3922. It now appears that this is the true B-3747, while the greater part of the planting is B-3696.

Erect, seldom decumbent, good vigor, free stooling, seldom arrows. Stalks long, medium diameter, dull green with a red flush when exposed, medium bloom. Internodes medium to long, laterally compressed, somewhat inequilateral, the front straight and the back somewhat convex, conspicuously staggered, furrow well developed. Nodes but little constricted, oblique; growth ring medium width, slightly depressed, bright green; root band oblique, 6 to 8 mm., slightly elevated, concolorous; rudimentary roots crowded, small inconspicuous, in 3 or 4 rows; leaf scar glabrous, appressed behind; glaucous band well marked, slightly constricted. Buds ovate, obtuse,  $12 \times 15$  mm., exceeding the growth ring by one-half, margin rather broad, uniform, germination apical, basal plac and a marginal vestiture of white hairs. Leaf sheaths with sparse vestiture of short hairs soon glabrate, green, not glaucous; throat lannate and with tufts of long hairs at the margins; collar narrow, not reaching the midrib, glaucous, the margins lannate; ligule about 3 mm., the margin even; ligular processes small, poorly developed. Leaf blades spreading, flat rather narrow, about 6 cm., light green, very minutely serrulate, the base even, not ciliate.

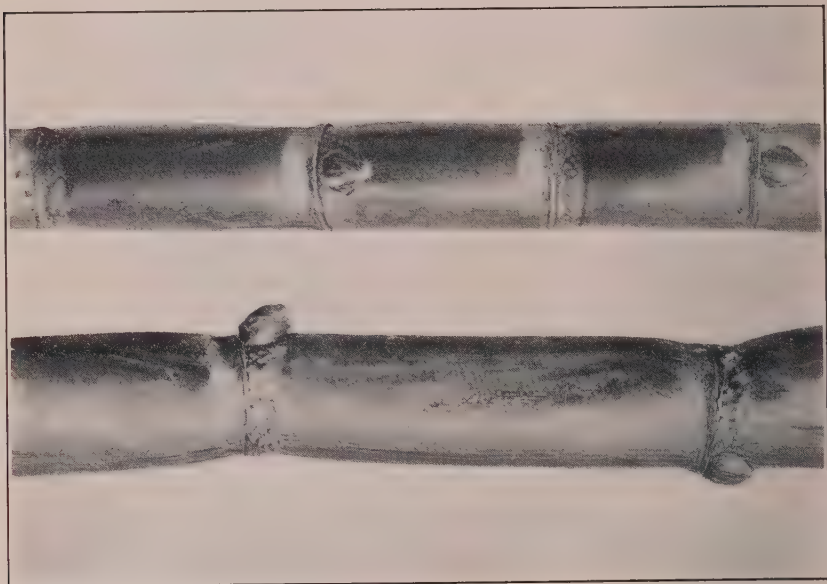
This seems to be a good general-purpose cane yielding a fairly good tonnage. It does not ripen quite as early as Cristalina but at full maturity it develops high sucrose and purity.

It was included in the Santa Rita immunity experiment, but a very poor stand was secured and the few plants which survived failed to take the mosaic. It has contracted it, however, at the Hatillo Fruit Company farm, seeming to suffer about like the Rayada. Its reaction to gum disease has not been determined.

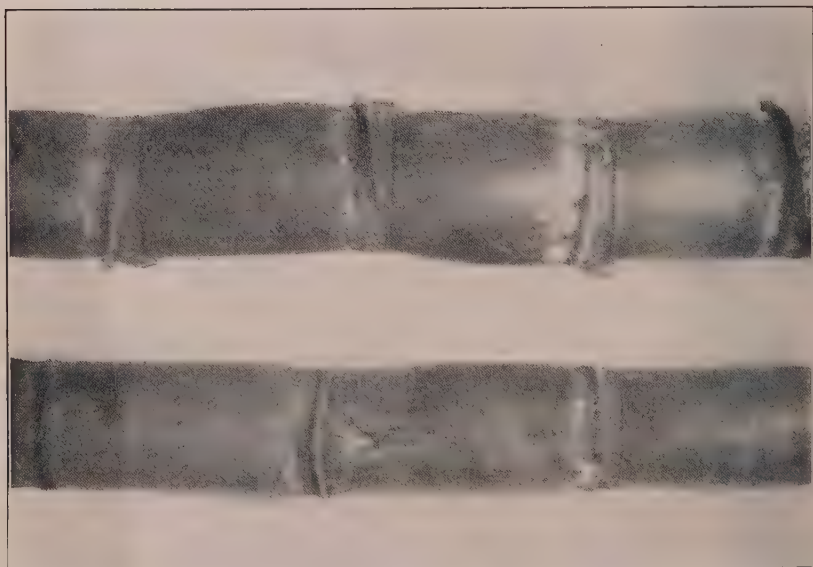
In the Aguirre test plots in January 1911 it gave: tons cane, 70.305; brix, 17.65; sucrose, 14.77; purity, 83.7; tons sugar, 7.47.

This is a fine record, though the cane was evidently still green when cut. Its best record is for a car from the Hatillo Fruit Com-





B 3708



B 3747

pany ground at Central Vannina June 11, 1920, which gave: brix 22.2; sucrose, 20.35; purity, 91.67. It was sold on the basis of sucrose content and under the prevailing terms brought 9.89 per cent to the grower in sugar on the total weight of cane. A cane capable of such a record is certainly worth further trial. Some analyses of immature cane are as follows:

Kind	Date	Age	Arrows	Extr.	Brix.	Sucr.	R. S.	Purity <sup>6</sup>	Fiber
B-3696.....	1-12-21	Pl. 15 mo. . .	No	72.7	14.95	11.66	2.09	77.99	9.82
Cristalina.....	1-12-21	Pl. 15 mo. ....	No	70.0	17.25	15.96	0.37	92.51	9.60
B-3696.....	2-11-21	Pl. 16 mo. ....	No	72.9	16.65	13.59	1.92	81.62	11.92
Rayada.....	2-11-21	Pl. 16 mo. ....	No	63.6	1.15	15.25	0.81	88.92	12.37
B-3696.....	4-11-21	Pl. 18 mo. ....	No	71.6	17.60	15.85	0.77	90.05	11.36
B-3696.....	2-11-26	Pl. 16 mo. ....	No		17.92	14.45		81.80	
BH 10 (12).....	2-11-26	Pl. 16 mo. ....	No		17.42	15.00		86.06	

The last series of analyses represent the result from a tonnage experiment at the Station, the cane being ground at Central Vannina. B-3696 in this experiments produced 41.94 tons of cane and 4.28 tons of sugar per acre, as against 54.81 and 6.05 tons respectively for the B.H. 10(12), which was used as a check. This experiment was made on good quality *vega* land. B-3696 stood sixth in sucrose in juice and per acre, amongst sixteen of our most promising kinds, while B.H.-10(12) stood fourth in sucrose in juice, but second in sugar per acre.

This variety is certainly worthy of further trial, particularly as an upland cane.

#### REFERENCES

- CRAWLEY, J. T.—Third Annual Report of the P. R. Ins. Expt. Station. Bull. 5; Aug., 1913.  
 ROSENFELD ARTHUR H.—General Variety Studies. 14th *Ibid*, 1923-24, pp. 62-4.

#### B-3696, Striped.

Mr. Luis Serrano has encountered and bred true to type a very pretty striped mutation of this variety, which in everything but color, seems identical with the parent variety. It should be tried out in comparison with the self-colored type in tonnage experiments.

#### B-3708. See Plate XI, opposite page 115.

Mr. Sewall notes having received this cane from the Mayagüez Station. This Station received it from Mr. Sewall in 1911. Ratoons in 1913 gave: tons, 27.87; brix, 18.88; sucrose, 17.99; purity, 94.7. Its record in Circular 8 is total tons for crops, 47.81; brix, 18.44; sucrose, 17.27; purity, 93.6. The lowest in tonnage out of 25 kinds.

Not seen.



**B-3747.** See Plate XI, opposite page 115.

This kind was included in the plantings made at this Station in 1911. Seed from Central Guánica. In 1915 as plant cane it gave: tons cane, 27.42; brix, 19.19; sucrose, 17.81; purity, 92.8. Cristallin from same field gave, tons, 22.10; brix, 17.98; sucrose, 16.55; purity, 92.0. There is no other record of this cane in Porto Rico except the planting on the farm of the Hatillo Fruit Company already noted. Where recently sorted out and planted in pure culture it is making a good growth and promises a heavy yield. An analysis made June 24, 1920, gave: brix, 21.42; sucrose, 19.07; purity, 90.29. Figuring according to the Vannina contracts at 65 per cent of the yield of sugar this would give 9.28 per cent to the grower. It closely resembles B-3922, but the cilia on the leaf scar are even longer and more abundant and the bud is a little longer and more acute.

#### REFERENCES

BOVELL, J. R., AND D'ALBUQUERQUE, J. P.—Seedling Canes and Manurial Experiments for the Season 1909-1911. Local Dept. of Agr. Barbados.

WATTS, FRANCIS. Sugar Cane Experiments in the Leeward Islands. Pt. I, Experiments with Varieties of Sugar Cane, Season 1919-20. Issued by the Commissioner of Agriculture for the West Indies: 1921.

**B-3750.**

Introduced by this Station in 1911 from Barbados. No records of results.

Not seen.

**B-3819.**

Probably introduced by Mr. Murphey from Barbados. It figures frequently in his reports from Guánica during 1911, 1912 and 1913, and as much as 26½ acres of it was grown at Guánica in 1915. No record of its being planted elsewhere.

Not seen.

**B-3859.** See Plate XII, opposite page 123.

Introduced by this Station in 1911 from Barbados. There is now a considerable acreage of it at the Hatillo Fruit Company's farm near Río Piedras from seed obtained here. Seed was sent from Fajardo for the immunity experiment at Santa Rita, where it seemed strongly resistant to mosaic. It was grown on a field scale at Fajardo and does not seem to have been planted elsewhere in the Island. Seed was again brought to the Station in the fall of 1919 from the Hatillo Fruit Company's farm.

It is a strong-growing dark-purple cane but it has not been sufficiently tested to venture an opinion as to its real value. In 1915 as plant cane it gave: tons, 26.10; brix, 16.66; sucrose, 14.56; purity, 87.5. On January 14, 1921, as plant cane at 15 months it gave only brix, 14.10; sucrose, 10.84; purity, 76.87; showing that it is rather late in maturing. The following further analyses have been made:

Location	Date	Mill	Brix	Sucrose	Purity	Age
Ins. Sta.....	IV-23-21	Hand	18.40	16.51	89.07	18 mths.
Cristalina.....	IV-23-21	Hand	18.80	16.92	98.48	18 mths.
Aguirre.....	I-24-23	Hand	19.90	16.95	85.20	13 mths.
Aguirre.....	II-23-23	Hand	20.40	17.45	85.50	14 mths.
Aguirre.....	III-22-23	Hand	20.30	18.22	89.90	15 mths.
Aguirre.....	IV-21-23	Hand	19.75	17.80	87.60	16 mths.
Ins. Sta.....	V-14-23	Hand	21.20	19.45	91.75	12 mths. ratoons.
Cristalina.....	V-14-23	Hand	19.90	18.84	94.67	12 mths. ratoons.
Aguirre.....	XI-29-21	Hand	14.70	11.49	78.20	16 mths. G. C.
Aguirre.....	XII-13-24	Hand	16.75	14.55	86.90	16½ G. C.

Earle reported on this variety from Central Aguirre that—

“It looks well in all new plantings, keeps well in field and is well adapted to South Coast.”

Erect, at length recumbent, fairly vigorous, good stooler. Stalks long, medium girth, purple, medium bloom. Internodes medium length, somewhat tumid, staggered, furrow narrow and shallow, sometimes missing. Nodes conspicuous, oblique; growth ring narrow, 2-4 mms., even brown to concolorous; root band wide, oblique, yellowish green to concolorous; rudimentary roots large, distinct and crowded, in 3-4 rows, purple; leaf scar glabrate, appressed behind; glaucous band medium width, constricted and distinct. Buds medium to large, 8-10 mms., plump, oval, exceeding growth ring by one-fourth, germination apical, margins narrow, glabrate, on upper half only, short apical tuft, light basal plaes. Leaf sheaths with sparse vestiture of tawny hairs at back, sides glabrate, tinted inside and out; throat wide, distinct, covered with black wax, long and coarse hairs at sides; collar broad, reaching midrib, glaucous; ligule narrow, flambrate, ligular process none. Leaf blades erect with declining tips, susceptible to leaf spot, medium width, about 6 cms, dark green, minutely and uniformly serrulated, sparse basal ciliation.

#### REFERENCES

WATTS, FRANCIS.—Sugar-Cane Experiments on the Leeward Islands in the Season 1918-19, Pt. 1. Experiments with Varieties. Issued by the Commissioner of Agriculture for the West Indies.  
*Idem.*—1919-20.

\* B-3922. See Plate II, opposite page 119.

Seedlings of B-647. Probably introduced from Barbados by Mr. Murphey. It is frequently mentioned in his reports at Guánica during 1911 and 1912. Seed was brought here from Guánica in 1911. It was being very extensively planted at Guánica up to the mosaic outbreak in 1919. Since then it has been little planted, since it suffers seriously from this disease. It was in cultivation at this Station in 1911 and 1912. It has been somewhat cultivated at Fajardo but with less satisfactory results than at Guánica. Not seen in other parts of the Island.

Erect but at length declined, vigorous, a good stooler, seldom arrowing. Stalks long, medium diameter, green with a reddish flush, light bloom. Internodes medium to long, nearly cylindrical but a little flattened, sometimes shouldered below, straight or a little staggered, sometimes checking in lines, furrow slight but evident. Nodes slightly constricted, oblique; growth ring poorly defined, often purplish; root band oblique, narrow, 5 to 8 mm., concolorous, rudimentary roots small, crowded, in about 3 rows; leaf scar conspicuously ciliate with white, erect hairs about 3 mm. long; glaucous band well marked, about 8 mm., somewhat constricted. Buds usually tinted, broadly triangular-ovate, obtuse, often broader than long, 10 to 12 × 10 mm., slightly exceeding the growth ring, margin medium width, uniform, germination apical or subapical, with basal plaes and scanty marginal vestiture. Leaf sheaths with short scanty vestiture, green, little or no bloom; throat narrow, pallid, sparingly lannate, and with a circle of scattered, rather stout hairs, especially on the margins; collar narrow, pallid, scarcely reaching the midrib, minutely lannate; ligule about 3 mm., minutely fimbriate; ligular processes none or poorly developed. Leaf blades spreading or somewhat erect, about 6 cm., light green, minutely serrulate, the base somewhat ciliate.

In the Guánica district, where it was usually planted as *gran cultura*, this cane gave a heavy tonnage and very satisfactory sucrose. It has not been sufficiently tested elsewhere.

It is fairly resistant to root disease and ratoons well but it suffers seriously from mosaic, being rather more susceptible than Rayada and Cristalina. Its resistance to gum disease has not been tested. It is a soft cane and is often badly eaten by rats.

In January, 1914, one plot at Guánica gave: tons cane, 60.81; sucrose, 14.7; purity, 82.8. The remainder of the field in other varieties gave only 42.82 tons. In February, 1914, another field gave: tons cane, 62.84; sucrose, 15.6; purity, 85.9; tons sugar, 7.66; Fajardo in 1916 reports: tons cane, 21.55; sucrose in cane, 12.6; purity,



PLATE II



B. 1809



B. 3922



Ba. 6032



Ba. 11569



B. S. F. 1250



Cavengerie



Co. 213



C. H. (64) 21



D. 433



89.4; tons sugar, 2.71. Other reports are still lower. The few available late analyses follow:

Kind	Date	Age	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
B-3922.....	12-15-20	Rat. 14 mo.	70.9	14.33	10.39	2.70	72.50	11.45
Cristallina .....	12-15-20	Rat. 14 mo.	70.0	17.50	15.53	0.28	88.74	9.60
B-3922.....	2-11-21	Pl. 16 mo.	71.8	17.06	15.35	0.91	90.02	12.40
Rayada .....	2-11-21	Pl. 16 mo.	63.6	17.15	15.25	0.81	88.92	12.87
B-3922.....	1-24-23	Pl. 13 mo.	Aguirre	18.90	16.90	.....	89.40	.....
B-3922.....	2-23-23	Pl. 14 mo.	Aguirre	20.20	17.19	.....	85.10	.....
B-3922.....	3-22-23	Pl. 15 mo.	Aguirre	20.70	18.45	.....	89.10	.....
B-3922.....	Dec. 24	Pl. 16 mo.	Aguirre	17.00	14.84	.....	87.30	.....
B-3922.....	Dec. 24	Pl. 16 mo.	Aguirre	18.00	15.92	.....	86.30	.....

The last two Aguirre analyses represent factory figures from a seven-acre *poyal* field at Hacienda Isidora at Central Aguirre, which field produced 45.53 tons of cane and 5.35 tons of sugar per acre—not at all a bad showing for this type of land. Earle considered this variety well adapted to the South Coast.

## REFERENCES

FOSS.—Summary of Cane Varieties at Central Aguirre for Crop 1924-25.

WATTS, FRANCIS.—Sugar-Cane Experiments in the Leeward Islands, 1919-20. Pt. 1, Expts, with Varieties, pp. 1-53. Comm. Agr. for W. I.

## B-4028.

Seed of this kind was brought to this Station from Guánica in 1911. It is growing in the Fajardo Experimental plots but it does not seem to have been extended on a field scale. Seed was brought from Fajardo to this Station in November, 1919. It was also sent from Fajardo for the immunity test at Santa Rita, but it failed to germinate.

## B-4507.

Introduced from Antigua by Mr. Sewall in 1911. It does not seem to have been planted elsewhere.

Not seen.

B-4578. See Plate XIII, opposite page 121.

This kind was planted at this Station in 1911 with seed brought from Central Guánica. Only very poor yields are recorded. It does not seem to have been planted elsewhere.

Not seen.

## REFERENCES

BOVELL, J. R., AND D'ALBUQUERQUE, J. P.—Seedling Canes and Manurial Experiments for the Season 1911-13. Local Dept. of Agr. Barbados.

WATTS, FRANCIS—Sugar-Cane Experiments in the Leeward Islands in the Season 1919-20. Pt. I. Expts. with Var. of Sugar Cane. Issued by the Commissioner of Agriculture for the West Indies.

\*B 4596. See Plate XIII, opposite page 121.

Seedling of B-521.—Introduced from Antigua by Mr. Sewall in 1909. Mentioned in Mr. Murphey's report from Guánica in 1910, but seems to have been very little planted there. It was planted in a small way at Fajardo for a number of years, 13.55 acres being harvested in 1919. It was tested at Central Lafayette, 1914-1916. It has been considerably planted at this Station, seed being obtained from Mr. Sewall in 1911. and seed has been widely distributed on account of supposed disease resistance.

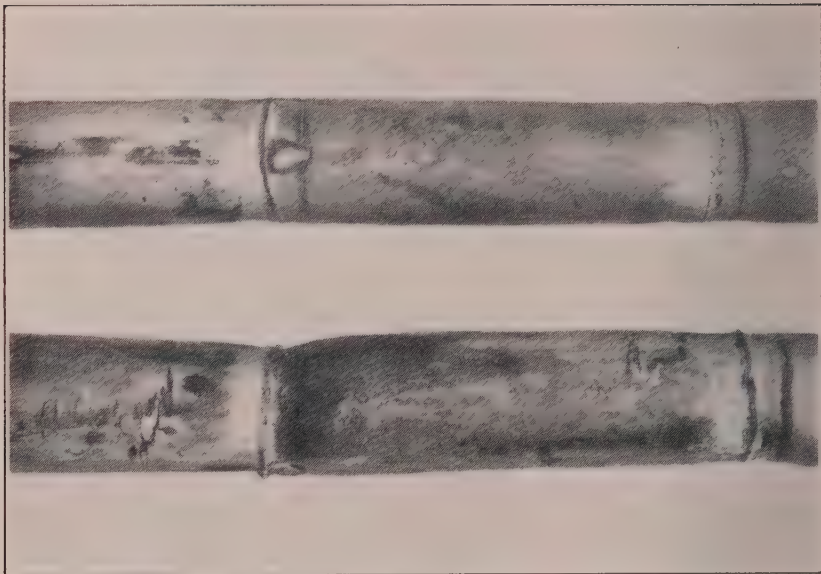
Erect, or at length decumbent, vigorous, a free stooler, arrows frequently. Stalks long, medium to medium small diameter, green with dull reddish flush, usually checking in lines, but little bloom. Internodes medium length, flattened, slightly tumid, nearly straight, furrow fairly well marked. Nodes constricted, oblique, growth ring narrow, inconspicuous, even concolorous; root band narrow, oblique 5 to 8 mm., bright green; rudimentary roots large, yellowish, crowded, in 2 to 3 rows; leaf scar glabrous, appressed behind; glaucous band, narrow, 7 to 8 mm., sharply constricted, conspicuous. Buds large, broadly ovate, obtuse, 12 to 13  $\times$  12 to 13 pm., exceeding the growth ring, margin broad, 2 mm. or more, slightly shouldered, germination subapical, nearly glabrous, apical and marginal hairs short and scanty. Leaf sheaths glabrous, green, glaucous; throat lannate and with a sparing vestiture of medium hairs on the margins; collar broad, pallid, reaching the midrib, glaucous, the margins lanrate; ligule about 4 mm., the margin undulate and slightly fimbriate; ligular processes none. Leaf blades spreading, abundant, flat, somewhat 2-ranked, 6 cm., light green, minutely serrulate, the base even, not ciliate.

The agricultural value of this cane is still uncertain. It is adapted to low, wet, compacted lands where Rayada begins to fail and in such localities it gives heavy tonnage and ratoons well. It makes a poor growth on dry hill lands. It is very late in maturing and when green gives the lowest sucrose and purity of any kind tested. Our records are far from complete but they fail to show that it ever develops more than a very ordinary degree of sweetness.

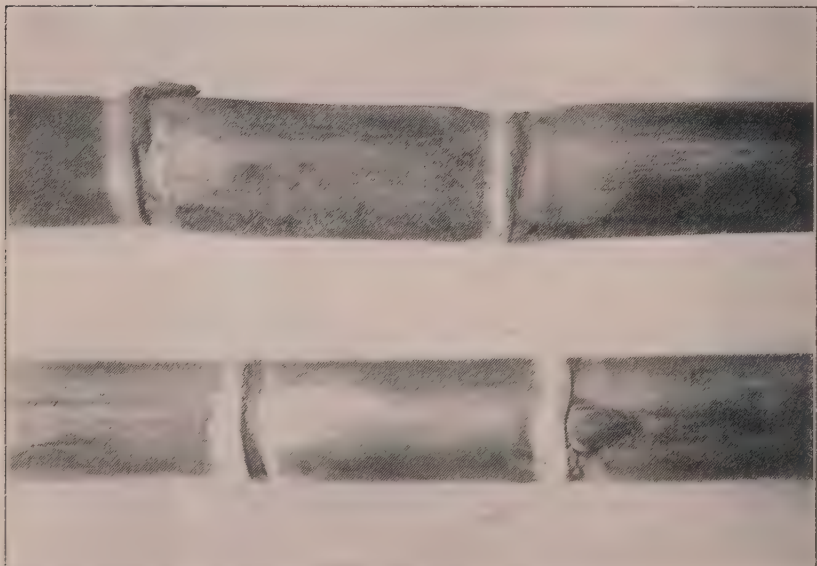
This cane is undoubtedly very resistant to root disease, but this seems to be its only virtue. It was among the very few kinds which developed no top rot whatever in the Santa Rita immunity test. At



B 4578



B 4596



one time it was recommended as having great resistance to mosaic, but this claim has not been substantiated. It perhaps takes the disease a little less readily than some other kinds, but when attacked it suffers nearly as much as the Rayada. Its resistance to gum disease has not been determined. As a cane for low compacted lands it seems to have no advantage over Yellow Caledonia, and in our tests it invariably falls below this kind in sucrose and purity. It should only be planted for some special object and with these facts in mind.

In Circular 8 its record is third in tonnage out of 25 kinds; total tons, 3 crops, 108.5; brix, 15.03; sucrose, 12.73; purity, 84.2, or an average yield of 3.31 tons of sugar. The Fajardo reports indicate an average of 3.38 tons sugar per acre in 1916-17 and 2.72 tons in 1918-19. At Central Lafayette as plant cane in 1914 it gave, brix, 19.8; sucrose, 17.6; purity, 88.8, which is the highest analysis in our records. Other analyses follow:

Kind	Date	Age	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
B-4596.....	1-5-20	Rat. 14 mo....	65.0	13.27	10.15	.....	76.50	.....
B-4596.....	12-20-20	Rat. 14 mo....	71.0	13.30	9.34	2.34	70.22	11.60
Cristalina.....	12-20-20	Rat. 14 mo....	70.0	17.50	15.53	0.28	88.74	9.60
B-4596 (1).....	1-14-21	Pl. 15 mo.....	68.7	13.10	9.64	2.41	73.58	10.64
Cristalina.....	1-14-21	Pl. 15 mo.....	70.0	17.25	15.96	0.37	92.52	9.60
B-4596.....	4-13-21	Pl. 18 mo.....	68.4	16.00	13.65	1.46	85.31	12.64

(1) Lowest in sucrose out of 40 kinds.

A cane of absolutely no promise whatsoever for Porto Rico.

#### REFERENCES

COWGILL, H. B.—Distribución de Caña para Semilla. P. R. Ins. Expt. Station, Cir. 8; 1917.

VEVE, RAFAEL A.—Our Experience with Cane Varieties. Mem. Assn. of Sugar Technologists of Porto Rico, I, 1, pp. 28-31; June, 1922.

B-4934. See Plate XIV, opposite page 125.

Was in cultivation at this Station from 1911 to 1916. The seed came from Central Guánica. It does not seem to have been cultivated elsewhere.

Not seen.

#### REFERENCES

CRAWLEY, J. T.—Varieties of Canes. Annl. Rept. of the Ins. Expt. Sta., published as Bull. 5, pp. 12-15; Aug., 1913.

WATTS, FRANCIS.—Sugar-Cane Experiments in the Leeward Islands, 1919-20. Pt. I, Expts. with Varieties, pp. 1-53; Comm. Agr. for W. I.



## B-6032.

Probably imported from Barbados by Central Mercedita of Ponce. Seed was brought to this Station from that Central in fall of 1919. It has been badly attacked by mosaic at Mercedita. This proves to have been Ba-6032, *q. v.*

## B-6048. See Plate XIV, opposite page 125.

Mr. Sewall notes that this kind came from the Mayagüez Station. It was in cultivation at this Station 1911 to 1916 with seed sent by Mr. Sewall but had disappeared. It was in the experimental plots at Fajardo and seed was again obtained there in November, 1919. In the Santa Rita immunity experiment it was strongly resistant to root disease and developed no top rot but it was quite susceptible to mosaic.

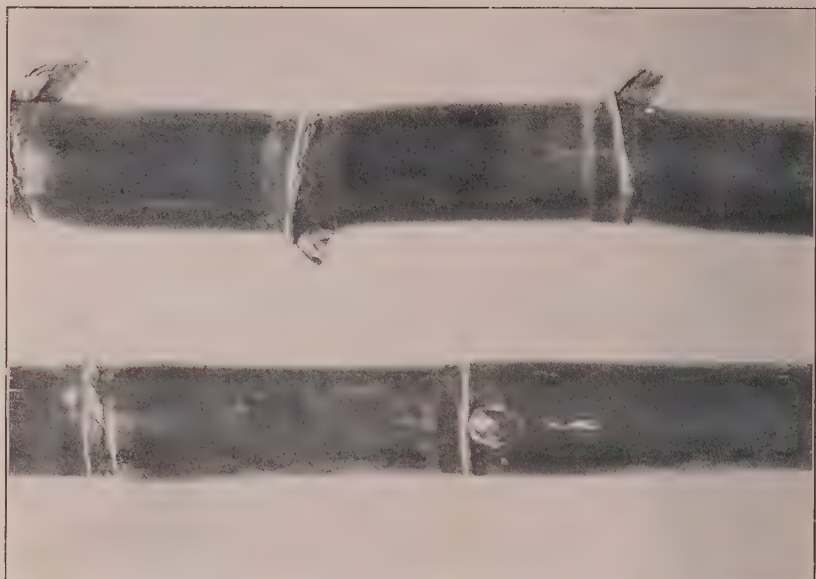
## \* B-6292. See Plate XV, opposite page 127.

A seedling of T-24. This kind was imported by this Station from Barbados in 1911. It does not figure in the available reports from either Guánica or Fajardo.

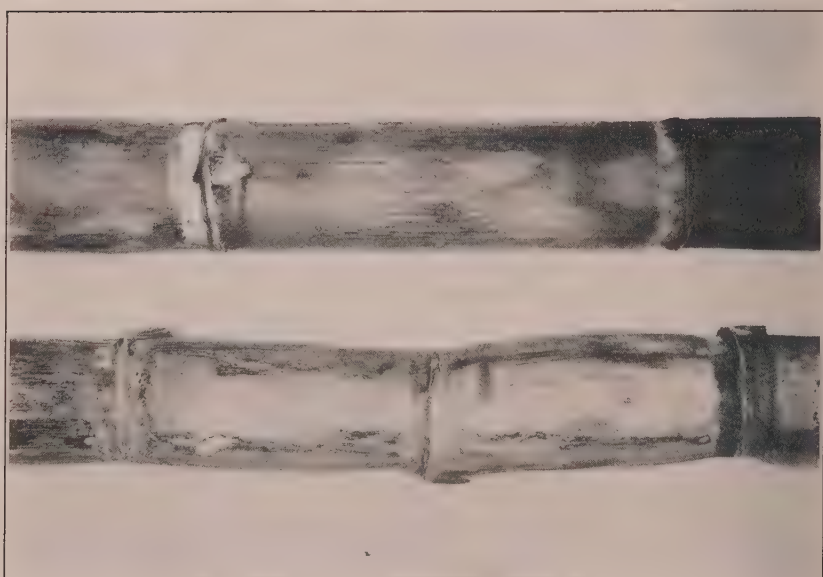
Erect or tardily decumbent, vigorous, good stooler, arrows occasionally. Stalks long, medium to medium slender, green with a dull red flush, but little bloom. Internodes medium length, somewhat compressed, inequilateral, slightly tumid on side opposite bud, furrow shallow but evident. Nodes slightly constricted, oblique; growth ring medium width, often slightly elevated, greenish; root band oblique, 6 to 10 mm., greenish; rudimentary roots crowded, whitish, in 3 or 4 rows; leaf scar glabrous, appressed behind; glaucous band slightly constricted, 8 to 10 mm., well marked. Buds broadly ovate, obtuse, sometimes broader than long, about 14 / 14 mm., exceeding the growth ring by one-third. margin broad, about 2 mm., uniform, germination apical or subapical, usually soon developing, with heavy basal plates and abundant marginal and apical vestiture. Leaf sheaths with rather scanty but long and coarse vestiture, green or sometimes a little tinted below, not glaucous; throat often crinkled, lannate, and with scanty marginal hairs; collar reddish brown, glaucous, the margins lannate; ligule about 4 mm., the edge uneven and flambrate; ligular processes none or small and poorly developed. Leaf blades abundant, flat, spreading, 5 to 6 cm., light green, minutely serrulate, the base even, not ciliate.

This is a valuable kind, especially for *vega* lands. It is not so well adapted to dry hills. It should be planted in the fall as *gran cultura*, since it is slow in maturing. It is adapted to the same conditions as Yellow Caledonia and it may be expected to make equally





B 3859



B 4395

as good tonnage and at full maturity to yield a larger per cent of sucrose.

In the Santa Rita immunity experiment it proved to be about equal to Rayada in root-disease resistance and to be rather more susceptible to mosaic. Its resistance to gum disease has not been determined.

The following items are from the Station records:

Kind	Date	Age	Tonnage	Brix.	Sucr.	Purity
B-6292 (1) .....	1915	Pl. ....	37.10	16.38	14.75	90.3
Cristalina .....	1915	Pl. ....	22.10	17.98	16.55	92.2
B-6292 (2) .....	May, 1916	Rat. ....	25.60	18.00	17.2	92.45
Cristalina .....	May, 1916	Rat. ....	18.80	18.8	17.8	94.14

(1) First in tonnage out of 20 kinds.

(2) Second in tonnage out of 20 kinds both as ratoon and for two crops.

Recent analyses are as follows:

Kind	Date	Age	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
B-6292 .....	12-15-20	Rat. 14 mo....	70.0	14.93	11.25	2.55	78.70	10.80
Cristalina .....	12-15-20	Rat. 14 mo....	70.0	17.50	15.53	0.28	88.78	9.60
B-6292 .....	1-24-20	Rat. 15 mo....	70.9	18.60	10.45	1.52	76.83	11.64
Cristalina .....	1-24-20	Rat. 15 mo....	70.3	17.85	15.44	0.33	90.12	10.30
B-6292 .....	2-7-21	Pl. 16 mo....	68.5	17.45	15.76	0.63	90.31	12.06
Cristalina .....	2-7-21	Pl. 16 mo....	68.6	17.90	16.14	0.803	90.16	13.81
B-6292 .....	4-11-21	Pl. 18 mo....	68.5	18.50	17.24	0.50	93.18	11.34
B-6292 .....	1-17-23	Pl. 18 mo....	Aguirre 20.50	17.30	.....	.....	84.40	.....
B-6292 .....	2-18-23	Pl. 14 mo....	Aguirre 20.80	17.98	.....	.....	86.50	.....
B-6292 .....	3-19-23	Pl. 15 mo....	Aguirre 21.10	18.96	.....	.....	89.80	.....
B-6292 .....	4-18-23	Pl. 16 mo....	Aguirre 18.50	15.76	.....	.....	85.20	.....
B-6292 .....	Dec., 1924	Pl. 17 mo....	Aguirre 19.29	16.88	.....	.....	87.50	.....
B-6292 .....	Dec., 1924	Pl. 18 mo....	Aguirre 17.76	14.46	.....	.....	81.30	.....

The last two analyses from Aguirre represent factory figures from two *poyal* fields, one of 15 acres at Hacienda Potala and the other of 4½ acres on Hacienda Carmen. The first yielded 42.38 tons of cane and 5.31 tons of sugar per acre, while the second produced 58 and 5.96 tons respectively—exceptionally good showings for this type of land. Earle in his Aguirre notes states that this is a very good cane for heavy soils, but that it should not be planted in light, sandy soils. All new plantings at Aguirre on heavy soils have been reported as doing finely. This is another cane which will stand more investigation and we have it planted in tonnage experiment at the Station on poorly drained *vega* land in comparison with other Barbados seedlings.

#### REFERENCES

- FOSS.—Summary of Varietal Results at Central Aguirre, 1924-25.  
 VEVE, RAFAEL A.—Our Experience with Cane Varieties. Mem. Assn. Sugar Technologists of Porto Rico, I, 1, pp. 28-31; June, 1922.

**B-6308.**

This seems to have been introduced by Central Mercedita of Ponce. Seed was brought from there to this Station in November 1919. But little attacked by mosaic at Mercedita. It promised and gave heavy tonnage, but a close study of its characteristics by the writer and Mr. Luis Serrano proved this to be another case of mixed numbers, as the cane we have under this number is typical D-109, which see, while B-6308 is a yellow cane of very distinct botanical and cultural characteristics.

## REFERENCES

HALL, R. R., & BOVELL, J. R.—Report on the Sugar-Cane Experiments for the Season 1918-20, Part III. Expts. with Varieties of Sugar Cane. Barbados Dept of Agriculture; 1920.

WATTS, FRANCIS.—Sugar-Cane Experiments in the Leeward Islands. Pt. I, Experiments with Varieties of Sugar Cane. Issued by the Comm. of Agriculture for the West Indies; 1921.

**B-6341.**

Was imported by this Station from Barbados in 1911. It was the lowest in tonnage out of 20 kinds in 1915, but one of the highest in sucrose.

Not seen.

**B-6346.**

Noted by Cowgill December 3, 1913, as seen in Mr. Sewall's collection at Naguabo. There is no other reference to this cane. (It is possible that B-6436 was intended?)

**B-6388.**

This cane was in cultivation at his Station from 1911 to 1916 from seed brought from Central Guánica. Its record was poor.

Not seen.

**B-6436.**

Introduced from Antigua in 1911 by Mr. Sewall. No other record of this cane has been found.

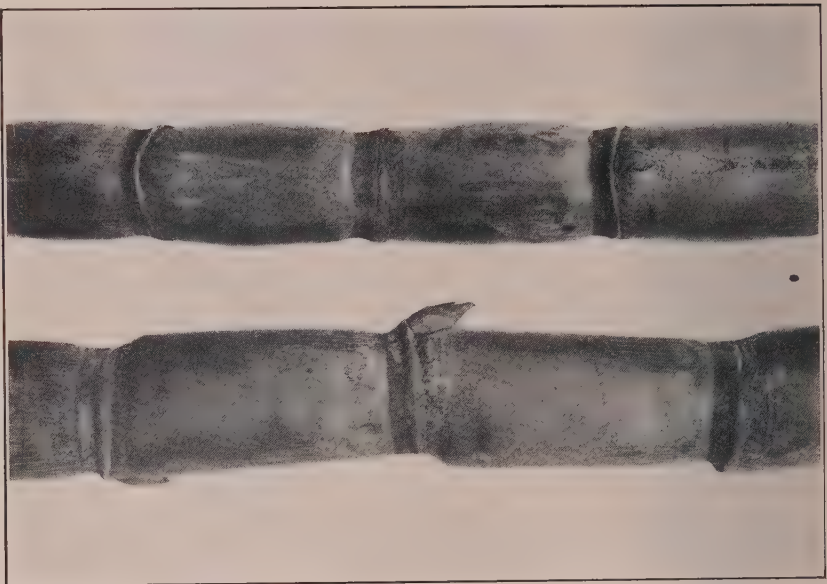
Not seen.

\* **B-6460.** See Plate XV, opposite page 127.

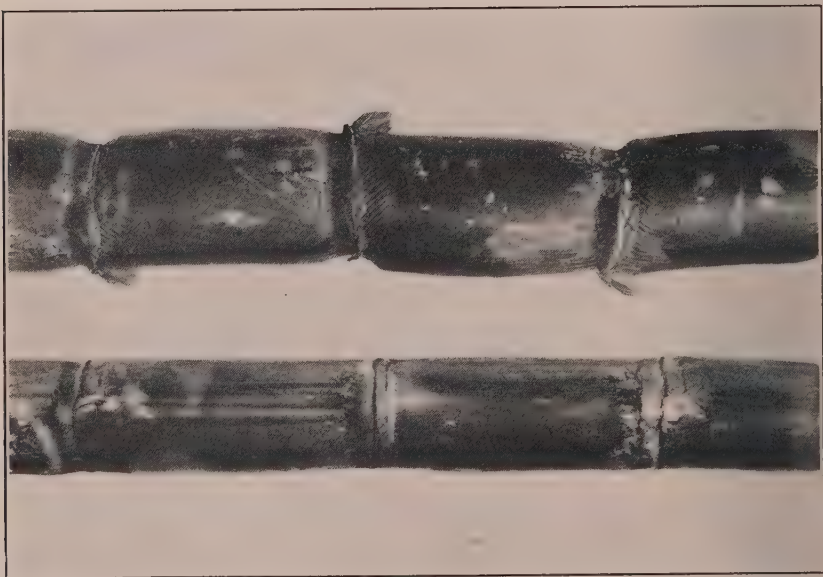
A seedling of T-24. It seems to have been introduced from Barbados by Mr. Murphey. It was not mentioned in his reports from Guánica during 1910, but occurs frequently in his 1911 and 1912 reports. It was planted for a while at Both Guánica and Fajardo and at Central Mercedita, Ponce. It has been sent out from this Station quite widely to different parts of the Island.







B 4934



B 6048

Soon decumbent, vigorous, good stooling, arrows infrequently. Stalks long, medium diameter, green, yellowish on maturity, little or no flush, sometimes checking in lines, some bloom. Internodes medium to long, somewhat tumid, usually enlarged below, more or less staggered, furrow broad but shallow. Nodes constricted, oblique; growth ring broad, elevated, concolorous; root band oblique, 6 to 10 mm., concolorous; rudimentary roots large, closely crowded, whitish, in about 3 rows; leaf scar glabrous or rarely very sparsely ciliate, appressed behind; glaucous band constricted, narrow, 6 to 8 mm., well marked. Buds large, ovate, or ovate-lanceolate, acute, 11 to 12  $\times$  16 to 18 mm., exceeding the growth ring by one-half or more, margin narrow, uniform, germination apical, short, rather scanty basal placs and scanty marginal vestiture of long hairs. Leaf sheath with scanty vestiture of short appressed hairs, green or slightly tinted below, not glaucous; throat narrow, lannate, with scanty marginal hairs; collar narrow, pallid glaucous, the margins lannate; ligule broad at center, reaching 5 mm., the ends tapering rapidly, fiambriate; ligular processes absent or poorly developed. Leaf blades abundant, flat, suberect, 6 to 6½ cm. wide, bright rather dark green, minutely serrulate to the base, scarcely ciliate.

This is a good general-purpose cane that Earle thinks should be more widely planted. It succeeds on a variety of soils and as it matures about with Cristalina it may be planted either in fall or spring.

It is decidedly more resistant to both root disease and mosaic than Rayada and Cristalina. Its resistance to gum disease has not been determined.

This cane was noted as one of the three best at Fajardo in 1914, the others being Yellow Caledonia and D-117, but its record as a sugar producer has been only medium at both Fajardo and Guánica, as well as at the Hatillo Fruit farm near Río Piedras. At Guánica it was included by Mr. Murphey in a list of best canes for 1911. In some variety plots at Central Mercedita, Yabucoa, on rich cow-penned land, cut February, 1920, as plant cane at 17 months, it gave, without irrigation, tons per acre, 65.6; brix, 16.30; sucrose, 13.82; purity, 84.8, being second in tonnage but first in sucrose out of 8 kinds. This would represent 6.527 tons sugar per acre. Available analyses are as follows:

Kind	Date	Age	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
B-6450 ....	12-2-20	Pl. 13 mo.	70.4	15.80	13.87	2.56	87.78	10.60
Ave. of 5								
Cheribon ..	12-2-20	Pl. 13 mo.	.....	.....	13.68	1.67	85.88	12.29
B-6450 ....	12-20-20	Rat. 14 mo.	70.3	16.53	14.23	0.21	86.08	8.31
Cristalina ..	12-20-20	Rat. 14 mo.	70.0	17.50	15.53	0.28	88.74	9.60
B-6450 ....	2-2-21	Rat. 16 mo.	71.6	17.05	15.03	0.56	88.15	9.08
B-6450 ....	2-2-21	Rat. 16 mo.	73.4	15.60	13.43	1.30	86.09	10.64
Cristalina ..	2-2-21	Rat. 16 mo.	70.3	17.85	16.14	0.33	90.42	10.69
B-6450 ....	2-7-21	Pl. 16 mo.	70.5	17.25	15.39	0.75	89.21	11.80
Cristalina ..	2-7-21	Pl. 16 mo.	68.6	17.90	16.14	0.803	90.16	13.81
<hr/>								
B-6450 ....	1-16-23	Pl. 13 mo.	Aguirre	17.55	15.26	.....	87.00	.....
B-6450 ....	2-17-23	Pl. 14 mo.	Aguirre	19.50	17.74	.....	89.10	.....
B-6450 ....	2-18-23	Pl. 15 mo.	Aguirre	19.80	17.56	.....	88.50	.....
B-6450 ....	4-17-23	Pl. 16 mo.	Aguirre	19.90	17.68	Tns. Cane p. a.	88.70	Tns. Sug. p. a.
B-6450 ....	Dec. 24	Pl. 17 mo.	Aguirre	17.16	14.79	.....	86.20	3.64
B-6450 ....	Dec. 24	Pl. 17 mo.	Aguirre	17.02	14.62	31.52	85.10	3.34
B-6450 ....	5-27-23	Rat. 13 mo.	Ins. Sta.	19.11	16.93	26.25	88.40	.....
11 109 .....	5-27-26	Rat. 13 mo.	Ins. Sta.	18.95	16.70	25.00	88.10	.....

There is certainly nothing strikingly favorable for B-6450 in any of the above figures—in fact the writer has been unable to find that this cane has distinguished itself anywhere in Porto Rico, despite its popularity at one time and the wide distributon of it made from the Station, apparently without much definite data as to its value under Porto Rican conditions. The showing at Aguirre is very poor indeed as compared with either B-3922 or B-6292. The cane has had a thorough proving in Porto Rico and there seems no reason to predict its continued cultivation on the merits of its results on the "Isle of Enchantment".

## REFERENCES

- HALL, B. A., & BOVELL, J. R.—Report on the Sugar-Cane Expts. for the Season 1918-20. Pt. III, Expts. With Varieties, pp. 19-77; Government of Barbados.  
 BOVELL, J. R., & D'ALBUQUERQUE, J. P.—*Ibid*, 1919-21, pp. 26-37.  
 B-6536.

This variety was in cultivation at his Station from 1911 to 1916, from seed brought from Central Guánica. It also occurred in the experimental plots at Central Fajardo and seed from there was again brought to this Station in November, 1919. It was included in the Santa Rita immunity experiment, where it showed medium resistance to root disease and rather strong resistance to mosaic. It is of only moderate vigor and medium sucrose content.

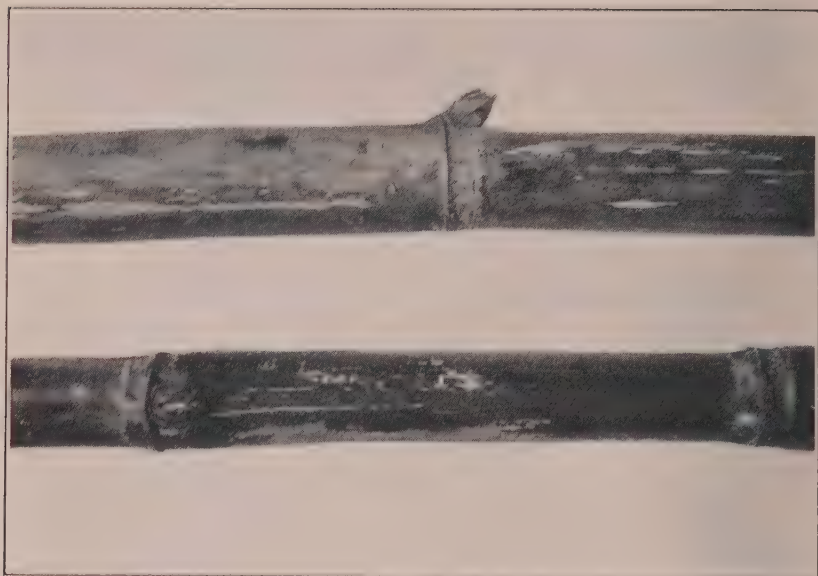
## REFERENCES

- COWGILL, H. B.—Report of the Plant Breeder. 4th Rept. of the Bd. of Commissioners of Agr. of P. R., 1914-15, pp. 22-23; 1916.  
 VEVE, RAFAEL A.—Our Experience with Cane Varieties. Mem. Assn. Sug. Tech. of P. R., I, 1, pp. 28-31 (with tables of analyses); June, 1922.

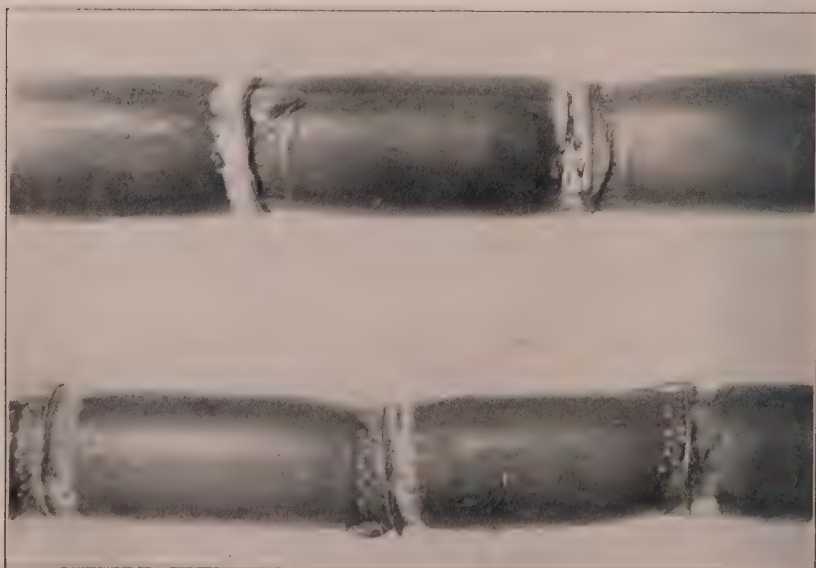




B 6292



B 6450



**B-6835.**

This was introduced from Barbados by this Station in 1911. It gave poor tonnage but good sucrose.

Not seen.

**B-7169.** See Plate XVI, opposite page 129.

Introduced by this Station from Barbados in 1911. It occurred in the experimental plots at Fajardo and seed was again brought from there in November, 1919. It is of medium vigor and sucrose content.

## REFERENCES

COWGILL, H. B.—A Method of Identification and Description of Sugar-Cane Varieties and its Application to Types Grown in Porto Rico. Jour. of the P. R. Dept of Agr., 1, 3, pp. 119-140; July, 1917.

WATTS, FRANCIS.—Sugar-Cane Experiments in the Leeward Islands, 119-20—Pt. I, Expts. with Varieties, pp. 1-53. Issued by Comm. Agr. for W. I.

**\* B-7245.**

Introduced by this Station from Barbados in 1911. It does not seem to have been grown elsewhere on the Island.

Strictly erect, vigorous, medium stooler, no arrows. Stalks medium length and diameter, green becoming yellow, with a red flush, little or no bloom. Internodes medium length, nearly cylindrical but abruptly shouldered below on side opposite bud, straight, furrowed. Nodes slightly constricted, oblique, growth ring narrow, usually elevated, brownish; root band narrow, oblique, 5 to 8 mm., constricted, concolorous or lighter; rudimentary roots pallid, crowded, in about 4 rows; leaf scar glabrous, usually prominent behind; glaucous band narrow, 5 to 8 mm., well marked, but little constricted. Buds small broadly ovate, obtuse, about 8 to 9 × 8 to 9 mm., not exceeding the growth ring, margin narrow, uniform, usually purplish. Germination apical, not developing on the standing stalks, short basal plates and sparse vestiture of white hairs on sides and apex. Leaf sheaths with a coarse abundant vestiture of strongly assurgent hairs, green, not glaucous; throat lannate and with a sparing vestiture of rather short white hairs; collar narrow, pallid, reaching the midrib, glaucous and more or less lannate throughout; ligule short, 3 mm., nearly even; ligular processes none. Leaf blades spreading, somewhat 2-ranked, flat, 6 to 7 cm. wide, bright green, minutely serrulate, the base sparingly ciliate.

This is a cane with unusually good keeping qualities in the field. It never arrows, almost never falls down and the buds do not sprout,

making it unusually well adapted to holding over as *caña quedada* or long-season cane. It grows late in the season and consequently is a little late in maturing but reaches nearly average in this respect. It is better adapted to *vega* lands.

Its reaction to the different diseases have not been determined. It is ratooning well and so must be fairly resistant to root disease.

Its early record at the Station is as follows:

Kind	Date	Age	Tons	Brix	Sucr.	Purity
B-7245 (1) .....	1915 .....	Plant .....	30.0	18.64	17.30	92.2
Cristalina .....	1915 .....	Plant .....	22.10	17.98	16.55	92.0
B-7245 (2) .....	May 1916 .....	Rat .....	37.80	19.1	18.0	94.24
Cristalina .....	May 1916 .....	Rat .....	18.80	18.8	17.8	94.14
B-7245 .....	4-30-19 .....	Rat 11 mo. ....	.....	20.0	18.32	91.51
B-7245 .....	Apr. 1920 .....	2nd Rat. 12 mo. ....	.....	20.7	18.23	88.88
B-7245 .....	5-18-20 .....	2nd Rat. 13 mo. ....	.....	21.75	19.50	89.65
B-7245 .....	1-13-20 .....	2nd Rat. 8 mo. ....	.....	14.82	11.19	75.55
Cristalina .....	1-13-20 .....	2nd Rat. 8 mo. ....	.....	.....	16.35	.....

(1) Fourth in tons out of 20.

(2) First in tons out of 20.

The late analyses are as follows:

Kind	Date	Age	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
B-7245 .....	1-19-21	Pl. 15 mo. ....	70.0	17.55	15.44	0.95	87.97	10.80
Cristalina .....	1-19-21	Pl. 15 mo. ....	70.0	17.25	15.96	0.87	92.52	9.60
B-7245 .....	2-14-21	Pl. 16 mo. ....	66.6	15.85	12.93	1.27	81.57	12.02
Rayada .....	2-14-21	Pl. 16 mo. ....	63.6	17.15	15.25	0.81	88.92	12.37
B-7245 .....	2-2-21	Pl. 20 mo. ....	70.1	18.55	16.78	0.71	90.18	13.15
B-7245 .....	4-13-21	Pl. 18 mo. ....	70.7	17.80	16.87	0.509	92.18	10.44

#### REFERENCES

COWGILL, H. B.—A Method of Identification and Description of Sugar-Cane Varieties and its Application to Types Grown in Pto. Rico. The Journal of the Department of Agr. of P. R., I, 3, pp. 119-40; July, 1927.

ROSENFELD, ARTHUR H.—List of All Sugar-Cane Varieties under Trial at the Ins. Sta. Annl. Rept. of Sta., 1923-24, pp. 63-4.

B-8660. See Plate XVI, opposite page 129.

Introduced by this Station from Barbados in 1911. Its record was medium both as to tonnage and sucrose.

Not seen.

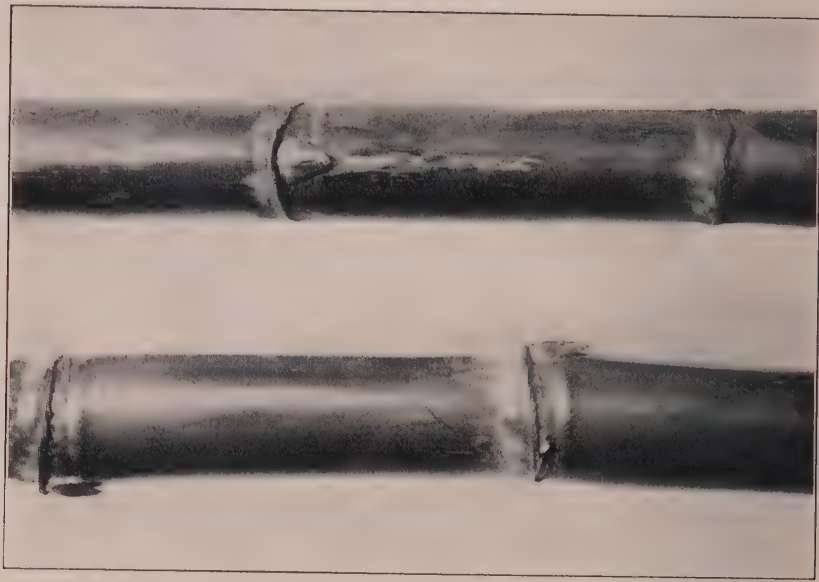
Ba-6032. See Plate II, opposite page 119.

Another one of the varieties obtained from Hon. J. R. Bovell, Director of Agriculture in Barbados, in 1922. Earle reports its introduction by Guánica Centrale in 1919.

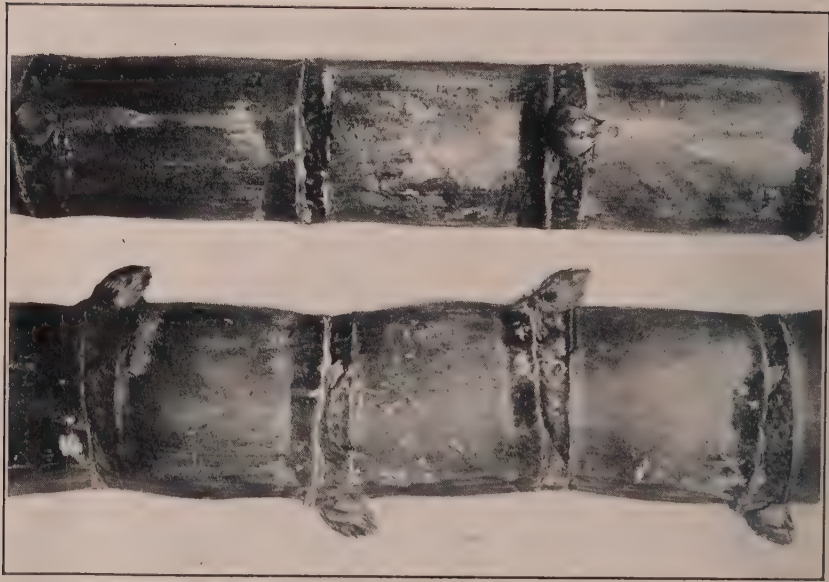
Recumbent, good vigor. Stalks long and medium diameter, yel-



B 7169



B 8660





low, becoming heavily flushed with age, large discolored white blotches and striations, some bloom. Internodes medium length, slightly tumid, tendency to split, very staggered, furrow traces to none. Nodes constricted and oblique; growth ring wide, even, brownish green to concolorous; root band wide, oblique and concolorous; rudimentary roots few and scattered, 2-3 in rows, purplish; leaf scar glabrate, appressed behind; glaucous band conspicuously sunken, broad and well defined. Buds large, 11-15 mms., exceeding growth ring by one third, oval, germination sub-apical, margins wide, purplish, abruptly shouldered at sides forming an urn-like shape, sides covered with short appressed hairs, light basal places. Leaf sheath with very scanty dorsal vestiture of short deciduous hairs, sides glabrate, inner margins heavily stained with purple, glaucous; throat wide, lannate with long coarse hairs at margins, collar narrow, rather inconspicuous, reaching mid rib, glaucous; ligule medium width, 3-5 mm., nearly even; ligular process 1-2 cms., on one side only. Leaf blades sub-erect with erect tips, wide, 8-10 cms., dark green, margins minutely and uniformly serrulated, with long straggling hairs at base.

This fine-looking cane, which is very similar to B.H. 10(12) in general appearance, but can be easily distinguished from it by its broad, brownish-green growth ring, came to us from Barbados with a most excellent record, but with us on the North Coast has proven a consistently poor germinator and rather a poor ratooner, although on the South Coast, notably at Mercedita de Ponce and at Fortuna, it has given some very good showings as regards tonnage and sucrose content and has germinated well. Aguirre reports it very susceptible to gummosis. On writing to Mr. Bovell, the producer of this cane, in regard to its poor germination on the North Coast, he replied, under date of 12th March, 1925:

"About the germination of the Ba-6032, I can say that we in Barbados find germination excellent."

On a visit to the Station on 15th May, 1924, Mr. Bovell stated to the writer that this is considered an excellent cane in Barbados, although rather later maturing and not so sweet as B.H. 10-12.

Planted at the Station in 1922 in *vega* land, alongside B.H. 10(12), it never made growth as plant to compare with the latter and, while stooling fairly well as first ratoons, it was of inferior appearance to the B.H. 10(12) throughout the season. Planted on hill land in November, 1924, it showed very poor germination and was replanted three times without obtaining a perfect stand.

At both the Bayaney substation, on red hill land, and the "Los Caños" substation, on *vega* land of good quality, this variety is showing up very poorly.

The following analyses have been made:

Variety	Age	Location	Tns. cane p. a.	Brix	Sucr.	Purity	Tns. sugar p. a.
B-6922	13 mo.	In. Exp. Sta.		15.40	12.49	81.10	Dec., 1925
Cristalina	13 mo.	In. Exp. Sta.			13.69	85.88	Dec., 1925
B-6922	15 mo.	In. Exp. Sta.		17.90	15.94	89.06	Mar., 1921
Cristalina	15 mo.	In. Exp. Sta.		19.00	17.20	90.52	Mar., 1921
B-6922	Retosfo	In. Exp. Sta.		18.2	15.44	84.81	Mar., 1922
Cristalina	Retosfo	In. Exp. Sta.		20.80	19.92	95.77	Mar., 1922
B-6922	17 mo.	In. Exp. Sta.		15.4	13.57	88.16	Mar., 1925
B-6922	G. C.	Mercedita	62.12	Cosechada en			6.13
Cristalina	G. C.	Mercedita	62.56	Cosechada en			6.31
B-6922	G. C.	In. Exp. Sta.	30.80	15.09	13.40	84.69	2.96
B-6922	G. C.	In. Exp. Sta.	54.81	17.43	15.00	86.06	6.06

In the tonnage experiment, cut in Feb. 1926, with B.H. 10/12, for which figures are given above, Ba-6032 stood eighth in sucrose amongst sixteen kinds, giving the smallest production of sugar per acre of all. Hardly seems likely to compete with B.H. 10/12 successfully in Porto Rico, as it appears to be a more delicate cane in every sense.

#### REFERENCES

- LEeward ISLANDS—Rept. on Sugar Experiments in 1918.  
 ROSENFELD, ARTHUR H.—Rep. of the Spec. Technologist Annl. Rept. of the Ins. Expt. Sta. of P. R., 1924-25.

#### Ba-7924.

Received from its producer, Hon. J. R. Bovell, Director of Agriculture in Barbados, in November, 1924. A striking looking, well-developed cane, with a lanceolate bud like S.C. 12/4. Planted out in tonnage experiments in October, 1925, it has maintained a consistently better appearance and more vigorous growth than the B.H. 10/12, which is used as a check. Earle reported this cane in cultivation at the Station from seed imported from Barbados by Central Guánica in the fall of 1919, but the writer has been unable to find any record of it at that time.

Erect, later recumbent, good vigor, excellent stooler, early and prolific arrower. Stalks long and of good girth, light ashen green, later becoming pinkish brown, very heavy bloom. Internodes long, appressed at sides, staggered, furrow trace to none. Nodes slightly constricted at sides, staggered, oblique; growth ring very broad and elevated, oblique, light green to concolorous; root band medium width, oblique, concolorous; rudimentary roots large, few and scattered, purple, tendency to premature sprouting; leaf scar glabrate,

broad and prominent in front and appressed behind; glaucous band broad and conspicuous, constricted. Buds large, 10-12 mms., exceeding growth ring by one-third, triangular-ovate, germination apical, margins narrow, uniform and glabrate, no apical tufts, light basal places. Leaf sheaths glabrate, no wax, slightly tinted, inner, base green; throat broad, dark color, sparsely lannated with scattered long hairs at margins; collar broad, well defined, reaching midrib, glaucous; ligule narrow except at center, where it is concave, nearly even, ligular process inconspicuous, deciduous, on one side only. Leaf blades spreading with declining tips, medium width, about 6 cms., dark green, with prominent white midrib, uniformly and minutely serrulated, sparse basal ciliation.

## REFERENCES

BOVELL, J. R., & D'ALBUQUERQUE, J. P.—Report on the Sugar-Cane Expts. for the Season between 1920-22. Barbados Dept. Agr. *Idem*.—1921-23.

Ba-8069.

One of the canes brought by Mr. O. W. Barrett from Barbados in November, 1924. As it was planted out in tonnage experiments only in October, 1925, no data are available as to its indicated value in Porto Rico.

Erect, fair vigor. Stalks long and of medium girth, yellowish becoming reddish pink with exposure to sun, no bloom. Internodes long, almost cylindrical, staggered, no furrow. Nodes slightly constricted, oblique, concolorous; growth ring broad and prominent, yellowish green; root band wide, oblique, yellowish green to concolorous; rudimentary roots small and crowded, 4-6 in rows, purple; leaf scar glabrate, broad and prominent in front and appressed behind; glaucous band constricted, broad and conspicuous. Buds, large and plump, 9-11 mms., ovate, scarcely exceeding growth ring, germination apical, margins very broad and conspicuous, flat, on upper half only, purple brown, covered with vestiture of ashen hairs which are very characteristic, no apical tufts, light basal places. Leaf sheaths dorsally lannated, glabrate at sides, glaucous, lightly tinted, inner base also tinted; throat broad and well defined, covered with long, coarse hairs; collar broad and well defined, reaching midrib, lannate; ligule narrow, except at concave center, nearly even, ligular process long, broad and scimeter-shaped, on one side only. Leaf blades spreading with declining tips, medium to broad, 6-8 cms., dark green, white midrib, margins serrulated on upper two-thirds basal ciliation.

## REFERENCES

- BOVELL, J. R., & D'ALBUQUERQUE, J. P.—Report on the Sugar-Cane Expts., 1922-24. Barbados Dept. of Agriculture.
- ROSENFELD, ARTHUR H.—Rept. of Spec. Technologist. Ann. Rept. P. R. Ins. Expt. Sta. 1924-25.

Ba-8409.

Sent by the producer of this variety, Hon. John R. Bovell, Director of Agriculture in Barbados, at request of Commissioner of Agriculture Carlos E. Chardón, in November, 1924. Planted out in tonnage experiments in October, 1925, does not seem to have as good general vigor and development as B.H. 10(12), which is used as a check.

Erect, at length recumbent, fair vigor. Stalks long and of good girth, light ashen green, later becoming brownish pink, heavy bloom. Internodes long, appressed at sides, staggered, furrow broad and very shallow. Nodes slightly constricted and oblique; growth ring wide, elevated, oblique, yellowish green to brown; root band wide in front and very narrow behind, concolorous; rudimentary roots small, few and scattered, 3-4 in rows, purple, leaf scar glabrate, broad and prominent in front and appressed behind; glaucous band constricted, medium width and conspicuous on young joints. Buds large, 9-11 mms., plump, exceeding growth ring by one-third, lanceolate, germination apical, margins flat, medium width almost to base, scanty lannated, no apical tufts, heavy basal plates. Leaf sheaths subglabrate, little wax, slightly tinted within and without; throat medium width, lannated with coarse long hairs, long tufts at margin; collar broad and well defined, reaching midrib, lannate; ligule medium width, nearly even, ligular process broad and long, scimitar-shaped, deciduous and on one side only. Leaf blades spreading with declining tips, medium width, about 6 cms., dark green, uniformly and minutely serrulated, sparse basal ciliation.

## REFERENCES

- BOVELL, J. R. & D'ALBUQUERQUE, J. P.—Rept. on Sugar-Cane Expts., 1921-23. Barbados Dept. of Agr.
- Idem.*—1922-24.

Ba-11403.

Sent by the producer of this variety, Hon. John R. Bovell, Director of Agriculture in Barbados, at request of Commissioner of



Agriculture Carlos E. Chardón, in November, 1924. Planted out in tonnage experiments in October, 1925, does not seem to have as good general vigor and development as B.II. 10(12), which is used as a check.

Erect, at length recumbent, good vigor. Stalks long, medium girth, greenish yellow, becoming dark red and purple on exposure to sun, narrow, long, discolored, vertical striations, heavy bloom. Internodes long, rather tumid, staggered, no furrow. Nodes constricted and oblique; growth ring narrow, 2-4 mms., even, concolorous and inconspicuous; root band narrow: oblique, concolorous; rudimentary roots inconspicuous, few and scattered, 3-5 in rows, concolorous; leaf sheath glabrate, appressed behind; glaucous band constricted, narrow and inconspicuous. Buds medium size, 8-10 mms., ovate-lanceolate, scarcely exceeding growth ring, germination apical, margins flat, rather broad, purplish, scanty lannated, same lannation along fibro-vascular bundles, sparse apical tuft of long, white hairs, heavy basal placs. Leaf sheaths subglabrate, some wax, lightly tinted within and without, throat indistinct, lannate, with long straggling marginal hairs; collar wide, well defined, reaching midrib, glaucous; ligule narrow, becoming wider and peaked at center, nearly even, ligular process 2-3 cms., in length on one side only. Leaf blades erect with declining tips, medium width, about 6 cms., distinct white midrib, dark green, minutely and uniformly serrulated to base, scant basal ciliation.

#### REFERENCES

BOVELL, J. R., & D'ALBUQUERQUE, J. P.—Rept. on Sugar-Cane Experiments for the Season between 1919-21.—Barbados Dept. Agr. *Idem.*—1920-22.

Ba-11569. See Plate II, opposite page 119.

One of the three most promising canes in Barbados when it was obtained through the courtesy of Director of Agriculture John R. Bovell in 1922.

Erect, at length recumbent, good vigor. Stalks long and medium girth, yellow with long discolored white striations and some blotches, slight flush, some bloom. Internodes long, cylindrical, but slightly enlarged at base, somewhat staggered, no furrow. Nodes slightly constricted; growth ring broad and elevated, oblique, bright red to concolorous; root band wide, oblique and concolorous; rudimentary



roots crowded, inconspicuous, 3-5 in rows; concolorous; leaf scar glabrate, broad and prominent in front and appressed behind; glaucous band constricted, broad and well defined. Buds, large, 11-15 mm., not exceeding growth ring, orbicular, germination subapical, margins wide and covered with short appressed hairs, very light basal plaes. Leaf sheaths with scanty dorsal vestiture of short deciduous hairs, sides glabrate, slightly glaucous, inner base heavily stained with purple; throat rather narrow and well defined, with short appressed hairs at margin; collar narrow and well defined, reaching midrib, glaucous; ligule narrow 2-4 mm., nearly even; ligular process none. Leaf blades erect with declining tips, broad, 8-10 cms., dark green, margins uniformly and minutely serrulated, very sparsely ciliated at base.

This exceptionally good-looking cane has for several years been the rival of the famous B.H. 10(123) in the land of its birth. For instance D'Albuquerque reports that for the season 1923-25, in nine experiments with plant canes on black soils, Ba-11569 produced an average of 8,357 pounds sucrose per acre, while B.H. 10(12), under identical conditions, produced 8,019. On red soils as plant cane in four experiments, B.H. 10(12) averaged about one-half ton sugar more than the Ba-11569. This was the case, also, in three experiments with first ratoons on red soils, but, in an experiment with second ratoons on the same kind of soil, Ba-11569 was in the lead by about a quarter of a ton of sucrose.

The cane came to us, therefore, with a most excellent record, but on the North Coast it has proven a consistently poor germinator and not a particularly good ratooner, although inquiries to Mr. Bovell resulted in a statement that in Barbados the germination of this cane had been found to be "excellent". On the South Coast of Porto Rico, notably at Mercedita de Ponce and Aguirre, it has given rather a better account of itself as regards tonnage and sucrose and has germinated consistently well, indicating, that it is more at home under the conditions of the South Coast, despite the fact that it does best on black land in its native home.

Planted at the Station in 1922 in *vega* land, alongside B.H. 10(12), it never made growth as plant to compare with the latter and, while stooling fairly well as first ratoons, was of inferior general appearance to the B.H. 10(12) throughout the season. As second ratoons it hardly stooled at all, whereas the B.H. 10(12) alongside produced a very good crop. Planted on red hill land in November, 1924, at the Station, it showed very poor germination indeed and

was replanted three times without a perfect stand being then obtained, there still being some 20 per cent of misses. A small field of this variety was planted by Mr. W. C. Dreier, manager of the Hatillo Fruit Farm, near Trujillo Alto, on dark upland soil and only about a 25 per cent germination was obtained. After the plat was concentrated by transplanting the stools the development was still very poor.

At both the Bayaney substation, on red hill land, and the "Los Caños" substation, on *vega* land of excellent quality, this variety is showing up very poorly.

The following analyses have been made:

Location	Date	Age	Mill	Tns cane per acre	Brix	Sucr	Purity	Tns sugar per acre
Ins. Expt. Sta. ....	XI-7-24	11 mos.	Hand		14.90	11.97	80.34	
Cent. S. Jean, Caguas.	X-25-25	11 mos.	Cent.		34.30	13.35	39.30	
Ins. Expt. Sta. ....	II-9-25	16 mos.	Cent.	35.14	16.92	15.00	89.40	8.94
BH10(12) .....	II-9-25	16 mos.	Cent.	34.81	17.14	15.18	88.04	6.06

In the tonnage experiment with B.H. 10(12), for which figures are given above, Ba-11569 stood fifth in sucrose content amongst sixteen kinds, but was ninth in production of sugar per acre. Another cane which seems hardly likely to successfully compete with B.H. 10(12) in Porto Rico, where it seems to be a decidedly more delicate cane in every respect.

#### REFERENCES

- RICHARDSON KUNTZ, P.—Ann. Rept. of the Div. of Agronomy for the Fiscal Year of 1922 to 1923. Ann. Rept. of the Ins. Expt. Sta. of Porto Rico, 1922-23, pp. 35-45. 1924.  
ROSENFELD, ARTHUR H.—Ann. Rept. for the Year 1923-24. *Idem*. —1923-24.

Ba-12079.

This variety has turned out to be about the second poorest of the fifteen Barbados varieties sent by Director of Agriculture John R. Bovell at the request of Hon. Carlos E. Chardón, Commissioner of Agriculture for Porto Rico and brought over by Agricultural Adviser O. W. Barrett in November, 1924. Planted out in tonnage experiments in October, 1925, there has as yet been no time for obtaining definite data as to yields and manufacturing value.

Erect, fair vigor, good stooler. Stalks long and rather slender, greenish yellow, heavily overlaid with dark wax deposit, some flush.

Internodes medium length, tumid and very staggered. Nodes distinctly constricted under bud, oblique; growth ring narrow and inconspicuous, even except for a slight elevation at back opposite bud, concolorous; root band narrow, oblique, concolorous, with heavy black wax deposit, rudimentary roots few and inconspicuous, large, concolorous; leaf sheath glabrate, broad and prominent in front and appressed behind; glaucous band rather constricted, narrow and inconspicuous, on older joints. Buds medium to large, 9-11 mms., plump, exceeding growth ring by one-third to one-half, triangular-lanceolate, germination apical, margins wide and flat, purplish, abruptly shouldered near base, subglabrate, no apical tufts, basal plane light. Leaf sheaths with abundant dorsal vestiture of short, fawny, deciduous hairs extending to sides, green, inner base heavily tinted with purple; throat narrow and very sparsely lannated, with few long, straggling hairs at margins; collar rather narrow, glaucous; ligule medium width, almost even, ligular process none. Leaf blades spreading with declining tips, medium width, 6-7 cms., dark green, minutely and uniformly serrulated, very sparse basal ciliation.

## REFERENCES

- BOVELL, J. R. & D'ALBUQUERQUE, J. P.—Rept. on Sugar-Cane Expts., 1921-23. Barbados Dept. Agr.  
*Idem.*—1922-24.

\*BH-10(12). See Plate XVII, opposite page 137; also Plate XVIII, opposite page 139.

Seedling of B-6835.

Imported by Central Guánica from Barbados in the fall of 1919. Part of this seed also sent to this Station. It also seems to have been imported independently by Central Mercedita of Ponce.

Erect, or at length somewhat declined, vigorous, a strong stooler, seldom arrows. Stalks long, medium to medium slender, greenish but soon flushing to a uniform dull pink, marked with lines. Often blotched, considerable bloom. Internodes medium length, staggered, somewhat compressed, larger below and shouldered on side opposite bud. Nodes constricted, oblique; growth ring rather broad but indistinct, enlarged on the shoulder behind; root band oblique, 6 to 10 mm., concolorous but paler, tapering downward, rudimentary roots small, purplish, in 3 or 4 rows; leaf sheath glabrous, appressed behind; glaucous band slightly constricted, about 8 mm., somewhat obscured by the bloom of the internode. Buds nearly orbicular, 10





TYPICAL STOOL OF B. H. 10<sup>(12)</sup>



to  $11 \times 10$  to 11 mm., only slightly exceeding growth ring, margin narrow, uniform, often purplish, germination subapical, basal places, and sparse marginal and apical vestiture. Leaf sheaths with a sparse vestiture of short appressed hairs, green or little tinted, somewhat glaucous; throat narrow, lannate with a sparse marginal vestiture of long hairs; collar narrow, scarcely reaching the midrib, glaucous; ligule, about 3 mm., margin undulate, not flambriate; ligular processes small and poorly developed or none. Leaf blades, suberect, the tips declined, flat, about 6 cm., widest above the middle, light green, minutely serrulate, the base even, not ciliate.

This famous Barbados hybrid has made a very favorable showing. It has proved to be adapted to a wide range of conditions and has even done well on the red shale hills. It is a good germinator and ripens sufficiently early to be used either for fall or spring planting. It ratoons very strongly. It is an unusually good general-purpose cane.

Its resistance to root disease is evidently good. It readily contracts the mosaic but resists its effect rather better than Cristalina, Rayada or S.C. 12/4, while its resistance to gum disease also seems more pronounced than with those varieties. At Santa Rita it has suffered rather heavily from leaf spot, also at Bayaney.

A small field of this cane at Central Mercedita cut early in the crop of 1921, as plant cane of 11 months gave over 6 tons of sugar per acre, which is an unusually good showing for such young cane. Earlier analyses were as follows:

Kind	Date	Age	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
B'H-10 (12).....	12-2-20	Rat. 13 mo ...	65.9	16.53	13.93	1.38	82.2	10.27
Ave. of 5 Cheribon.....	12-2-20	Rat. 13 mo ...	.....	.....	13.69	1.67	85.88	12.29
B H-10 (12).....	1-10-21	Rat. 14 mo.....	63.1	17.40	15.64	0.58	89.88	10.33
Cristalina.....	1-10-21	Rat. 14 mo.....	71.4	17.30	15.34	0.64	86.67	12.01
B H-10 (12).....	2-23-21	Rat. 15 mo.....	66.6	17.10	15.03	1.01	87.89	11.35
Cristalina.....	2-23-21	Rat. 15 mo.....	71.4	18.90	17.40	0.30	92.06	12.58
B H-10 (12).....	2-11-21	Pl. 16 mo.....	70.7	18.00	15.17	1.42	84.27	11.72
Rayada.....	2-11-21	Pl. 16 mo.....	63.6	17.15	15.25	0.81	88.92	12.37
H B-10 (12).....	4-13-21	Pl. 18 mo.....	70.3	18.50	16.71	0.82	90.32	11.88

The following six tables give its condensed history in its country of origin and in some of the other West Indian islands.

TABLE I

## CONDENSED COMPARATIVE RESULTS IN BARBADOS

Variety	Tons Cane per acre	Normal Juice					Lbs. Suc. per acre
		Suc.	Gluc.	S. N. S.	Purity	Glucose Ratio	
I. PLANT CANES ON COVERLY PLANTATION—MERIBA FIELD							
W. Transparent.....	80.67	2.09	.086	.174	88.92	4.13	8,829
B. H. 10 (12).....	86.83	2.36	.060	.180	90.77	2.57	11,539
II. PLANT CANES ON WATERFORD PLANTATION—TENNA NT FIELD							
W. Transparent.....	43.08	2.01	.058	.128	91.55	2.88	11,417
B. H. 10 (12).....	52.54	2.25	.052	.134	92.38	2.30	15,584
III. PLANT CANES ON DODD'S PLANTATION—UPPER CHAPEL FIELD							
W. Transparent.....	26.44	1.94	.086	.204	87.00	4.43	6,852
B. H. 10 (12).....	47.57	2.37	.046	.154	92.22	1.94	14,879
IV. MEAN RESULTS FOR THREE SEASONS ON DODD'S PLANTATION—UPPER CHAPEL, CAT HOLE FIELDS							
W. Transparent.....	25.08	2.03	.074	.....	88.86	3.70	6,843
B. H. 10 (12).....	39.31	2.33	.073	.....	91.17	3.13	12,265
V. DUPLICATE FIELDS ON COVERLY AND WATERFORD PLANTATIONS—FOUR EXPERIMENTS							
W. Transparent.....	36.87	2.05	.072	.....	90.23	3.50	10,126
B. H. 10 (12).....	44.68	2.30	.056	.....	91.58	2.44	13,583

TABLE II

COMPARATIVE RESULTS FROM GENERAL PLANTINGS OF D-625  
AND BH 10(12) IN BRITISH GUIANA FROM RETURNS  
SUPPLIED BY MANAGERS

	D--625	B. H. 10 (12)
Mean of all plantations.....	1.80	2.06
Maximum reported.....	2.85	3.04
Minimum reported.....	0.28	1.24





BARBADOS HYBRID 10 (12)

TABLE III

AVERAGE RESULTS FOR PLANT AND STUBBLE CROPS IN  
ANTIGUA, B. W. I.

Age	Variety	Tons Cane per Acre	Gallons Juice per Acre	Lbs. Suc. in Juice
Plant.....	White Transparent.....	14.73	1,460	3,000
Plant.....	B. H. 10 (12).....	17.32	1,640	3,800
Ratoons.....	White Transparent.....	10.83	1,040	2,280
Ratoons.....	B. H. 10 (12).....	11.43	1,210	2,910

TABLE IV

AVERAGE RESULTS FOR PLANT AND STUBBLE CROPS ON  
ST. KITTS, B. W. I.

Age	Variety	Tons cane per acre	Gallons juice per acre	Lbs. sucrose in juice per acre
Plant.....	White transparent.....	21.0	2560	5340
Plant.....	B. H. 10(12).....	26.9	2950	6600
Ratoons.....	White transparent.....			4910
Ratoons.....	B. H. 10(12).....			9170

TABLE V

AVERAGE RESULTS FOR PLANT CANE IN 1919-20 AND AS MEAN  
FOR ALL SEASONS ON ISLAND OF NEVIS, B. W. I.

Season	Variety	Tons cane per acre	Gallons juice per acre	Lbs. sucrose in juice
1919-20.....	White transparent.....	19.0	1,810	3,570
	B. H. 10(12).....	21.0	2,110	4,490
Mean of all	White transparent.....			4,000
	B. H. 10(12).....			5,360

TABLE VI

## FARRELL'S EXPERIMENT PLAT, MONSERRATE, B. W. I.

Age	Variety	Tons per acre	Data on juice				
			Extr.	Gals. per acre	Sucrose per acre	Purity	Lbs. suc. per acre
Plant.....	White transparent..	21.8	60.50	2,750	1,849	92.1	5,090
	B. H. 10(12).....	34.2	61.25	4,350	1,997	92.6	8,690
Ratoons...	White transparent..	9.3					
	B. H. 10(12).....	18.1					

The following tables give some recent large-scale results in Porto Rico, where it is now the most extensively planted cane:



TABLE VII

COMPARATIVE YIELDS ON THE SOUTH COAST FOR THE CROPS  
1921-22 INCLUSIVE

Variety	Acres	Age	Tons per acre	
			Cane	96 Sugar
I. CROP OF 1921				
B. H. 10(12) .....	4.75	Prim.	53.38	7.27
Cristalina .....	30.00	G. C.	52.50	6.31
B. H. 10(12) .....	29.00	Prim.	47.24	6.75
Cristalina .....	36.00	G. C.	48.88	6.38
S. C. 12(4) ..	14.50	G. C.	62.33	8.30
Cristalina .....	36.00	G. C.	47.88	6.06
II. CROP OF 1922				
S. C. 12(4) .....	17.00	Prim.	37.52	5.18
B. H. 10(12) .....	75.00	Prim.	28.19	4.25
B. H. 10(12) .....	4.00	G. C.	45.69	6.35
B-208 .....	1.75	G. C.	57.10	6.06
B. H. 10(12) .....	4.25	G. C.	82.85	10.99
D-109 .....	6.50	G. C.	74.86	8.71
Planted after cowpeas				

TABLE VIII

## BH-10(12) AT CENTRAL SANTA JUANA

Car No.	Brix	Sucrose	Purity	Factory Yield
1. ....	23.4	22.16	94.7	16.70
2. ....	22.0	20.97	95.3	15.90
3. ....	22.9	21.46	93.7	16.15
4. ....	22.6	21.32	94.3	15.13

These tables are taken from the work by the author on the B.H.-10(12) and S.C.-12/4 canes, to which the reader is referred for details as to age of cane, time of cutting, etc., etc., as well as for a discussion of the present and future prominent place taken by this exceptionally fine cane in the economy of the Porto Rican sugar industry. Additional data on the yields of this variety may also be found under St. Croix-12/4, *q. v.*

Resuming, this is the outstanding variety of Porto Rico today and one of the prominent varieties of the entire sugar-producing world. It seems destined within a very few years to occupy the

larger part of the cane area of the Island, with S.C.-12/4 taking second place.

## REFERENCES

- BOVELL, J. R., & D'ALBUQUERQUE, J. P.—Report on the Sugar-Cane Expts. for the Season 1914-16, pp. 15-80; 1916. (Also all later repts.)  
 ROSENFELD, ARTHUR H.—The B.H. 10(12) and S.C. 12(4) Canes. The Journal of the Dept. of Agriculture of P. R., IX, 3, pp. 215-47; July, 1925.

**BSF-12(34).**

Reported by Earle to have been introduced by Central Guánica from Barbados in the fall of 1919. Not seen.

## REFERENCES

- BOVELL, J. R., & D'ALBUQUERQUE, J. P.—Report on the Sugar-Cane Expts. for the Season between 1920-22. Pt. III, Expts. with Varieties.  
*Idem.*—*Ibid*, 1921-23.

**BSF-12(45).**

Reported by Earle to have been introduced by Central Guánica from Barbados in the fall of 1919. Not seen.

## REFERENCES

- BOVELL, J. R., & D'ALBUQUERQUE, J. P.—Report on the Sugar-Cane Expts. for the Season between 1920-22. Pt. III, Expts. with Varieties. Government of Barbados.  
*Idem.*—*Ibid*, 1921-23.

**BSF-12(48).**

Sent by the producer of this variety, Hon. John R. Bovell, Director of Agriculture in Barbados, in November, 1924. Planted out in tonnage experiments in October, 1925, this variety in appearance at least is superior to B.H. 10(12), which is used as the check.

Erect, good vigor, excellent stooler. Stalks long and rather slender, green, changing to uniform wine color, no bloom. Internodes medium length, slightly tumid, staggered, furrow slight to none. Nodes slightly constricted, oblique; growth ring narrow, even, inconspicuous, concolorous; root band narrow, oblique, concolorous; rudimentary roots inconspicuous, large, few and scattered, 2-3 in rows, reddish; leaf scar glabrate, appressed behind; glaucous band constricted, narrow and inconspicuous. Buds medium size, 8-10 mms., plump, ovate, scarcely exceeding growth ring, germination apical, margins narrow, abruptly shouldered at base, subglabrate, no

apical tufts, heavy basal plac. Leaf sheaths with scanty dorsal vestiture of short white hairs, sides glabrate, no wax, green within and without; throat broad and split, very sparsely lannated, few coarse hairs at margins; collar broad and reaching midrib, glaucous; ligule medium width, 2-3 mms., nearly even, no ligular process. Leaf blades spreading with declining tips, medium width, about 6 cms., dark green with broad white midrib, serrated on upper two-thirds, scant basal ciliation.

## REFERENCES

BOVELL, J. R., & D'ALBUQUERQUE, J. P.—Rept. on Sugar-Cane Expts. for the Season 1918-20. Barbados Dept. of Agriculture.  
*Idem.*—1919-21.

BSF-12(50). See Plate II, opposite page 119.

Sent by the producer of this variety, Hon. John R. Bovell, Director of Agriculture in Barbados, in November, 1924. Planted out in tonnage experiments in October, 1925, this variety in appearance at least is superior to B. H. 10(12), which is used as the check.

Erect, good vigor, fine stooler. Stalks long, good girth, green to dull yellow, sparse vertical, parallel striations on upper parts of joints, little flush and bloom. Internodes long, enlarged at base, staggered, furrow trace to none. Nodes nearly even, oblique; growth ring medium width, 2-3 mms., elevated, reddish brown, later concolorous, root band narrow, oblique, concolorous; rudimentary roots large, few and scattered, in 3-4 rows, reddish; leaf scar glabrate, broad and prominent in front and appressed behind; glaucous band broad, constricted and conspicuously dark. Buds large, 10-12 mms., exceeding growth ring by half, triangular lanceolate, germination apical, margins narrow, uniform, abruptly shouldered at base, glabrate, no apical tufts, heavy basal plac. Leaf sheaths with scanty dorsal vestiture of short, white, deciduous hairs, sides glabrate, no wax, light green within and without; throat broad, lannate, with medium width. 2-3 mms., nearly even, ligular process none. Leaf blades spreading with declining tips, medium width, about 6 cms., dark green, minutely and uniformly serrulated at margins, no basal ciliation.

## REFERENCES

BOVELL, J. R., & D'ALBUQUERQUE, J. P.—Rept. on Sugar-Cane Expts. for the Season 1918-20. Barbados Dept. of Agriculture.  
*Idem.*—1919-21.

**BSF-13(8).**

Reported by Earle as having been introduced from Barbados by Guánica Centrale in the fall of 1919. Not seen.

## REFERENCES

BOVELL, J. R. & D'ALBUQUERQUE, J. P.—Rept. on the Sugar-Cane Expts. for the Season between 1920-22. Pt. III, Expts., with Varieties.

*Idem.*—*Ibid*, 1921-23.

**BSF-13(14).**

Reported by Earle as having been introduced from Barbados by Guánica Centrale in the fall of 1919. Not seen.

## REFERENCES

BOVELL, J. R. & D'ALBUQUERQUE, J. P.—Rept. on the Sugar-Cane Expts. for the Season between 1920-22. Pt. III, Expts., with Varieties.

*Idem.*—*Ibid*, 1921-23.

**Bengala.**

Mentioned by López Tuero (p. 9). He says:

“Very much like Creole, with short, slender joints, juicy, very sweet, leaves strictly erect. But little cultivated, as it is easily attacked by insects. It is originally from Calcutta.”

We have no other knowledge of this kind.

**Bois Rouge.**

(=Palo Rojo). Stahl (p. 136):

“This cane has given admirable results in Mauritius and Bourbon, but here it is feeble and slender. The buds sprout easily on the standing cane, causing it to dry up.”

López Tuero (p. 9) calls it Palo-rojo and speaks of it in almost the same words. It was introduced by Dr. Grivot Grand-Court prior to 1879, probably from Guadaloupe.

No canes have been found that can be connected with this name, though at least two unnamed slender red canes are in the Station collections.

**Bois Rouge Blandee.**

(=Palo Rojo Claro). Stahl (p. 136):

“Color between light and dark; joints short, somewhat barrel-shaped, robust, and resist the disease. It seems to be one of the most valuable varieties for infested lands.”

We have no further knowledge of this kind. It probably came from the French islands. At least the name occurs in the literature in connection with Reunion.

#### Borbon.

(= Bourbon.) Both Stahl and López Tuero consider this distinct from the Otaheite though somewhat closely resembling it. Stahl says:

"Closely resembles Caña Blanca; when young it is spotted with red but later is yellowish green; very rich in sugar; should be planted only one seed in each hole, since it suckers abundantly; in every respect superior to Caña Blanca but it contracts the disease (epidemic of 1872) and should only be planted in districts free from it."

A cane known by this name was found in a colonia near Bayaney. When cultivated at the Station it proved identical with the cane grown at Coloso as Penang. It is quite certain that more than one cane has been included in the group sometimes known as Bourbon and sometimes as Otaheite, but to which one the name Bourbon properly belongs it will be difficult or perhaps impossible to determine.

#### Calancana.

(= Carandalí, = Imperial del Brasil, = Green Ribbon). Stahl 134, López Tuero 9. Imported from Cuba prior to 1877 by Patxot, Castello & Cía., of Cabo Rojo.

This cane seems quite clearly to be only a color variant of Otaheite (which see for further description), although this view has not been expressed in the literature.<sup>1</sup> In this form the stalks and leaf sheaths are striped with green and white. On some soils, especially on full exposure, the white flushes to a delicate pink. It is strikingly handsome cane, but it seems to have all of the cultural disabilities of the self-colored form, and so far as we know it is equally susceptible to all kinds of diseases. Its reputation as a very sweet cane is not borne out by the following analyses as compared with Cristalina on same date from same field:

		Arrows	Extr.	Brix.	Sucro.	Red. Sug.	Puri.	Fiber	Age
11-29-20....	Calacana .....	No	70.	13.37	9.42	4.34	70.45	12.2	18 mo.
11-29-20....	Cristalina .....	No	.....	.....	13.69	1.67	85.88	12.01	18 mo.
1-10-21....	Calacana .....	No	68.8	15.60	12.77	1.50	81.85	12.48	12 mo.
1-10-21....	Cristalina .....	No	71.3	17.30	15.34	0.64	86.67	12.29	12 mo.
2-9-21....	Calacana .....	No	67.6	15.25	12.29	1.64	80.45	12.96	15 mo.
2-9-21....	Cristalina .....	No	68.6	16.20	13.85	0.95	85.49	11.20	15 mo.

<sup>1</sup> Earle found a stool of Calancana with two stalks that had reverted to a solid green color and that are absolutely indistinguishable from Otaheite.



This cane is somewhat widely scattered in mixed planting, but it nowhere exists in pure cultures. There seems to be no reason for its further planting.

\* *Cavengerie*. See Plate II, opposite page 119.

(= Caña Colorada, = Caña Francesa, = Rosita, all local names.) Imported by Dr. Grivot Grand-Cour of Mayagüez, probably from the French islands, prior to 1878. It now occurs widely in mixed plantings and often nearly pure cultures in the northern and eastern districts, more especially in hill lands.

Habit erect very vigorous, strong stooling, seldom or never arrows. Stalks medium diameter, tall, dark wine color with faint bronze stripes; no bloom. Internodes medium to long, straight or slightly staggered, cylindrical or slightly larger below, furrow faint, usually evident but sometimes wanting. Nodes narrow, only slightly constricted; growth ring conspicuous, usually swollen at first yellowish then dark purple; root band narrow, 6 to 8 mm., concolorous; rudimentary roots inconspicuous, purplish, in 2 to 3 rows; leaf scar glabrous, narrow, somewhat oblique; glaucous band narrow, 6 to 8 mm., at first well marked. Buds ovate, medium size, about 10 to 12 × 10 to 12 mm., exceeding growth ring, margin narrow, uniform, germination apical, base sparingly appressed ciliate, sides and apex glabrous. Leaf sheaths with dense vestiture of short asurgent bristles, tinted, somewhat glaucous, marked with white or sometimes white and pink stripes; throat lannate, and with abundant medium short brownish hairs, especially on the shoulders; collar broad, dark conspicuous, densely lannate toward the margins; ligule narrow, 3 to 3½ mm., margin nearly even; ligular processes, none. Leaf blades erect, the tips declined, dark, green, medium width, about 6 cm., minutely but sharply serrulate to the base, not ciliate.

This is a cane of great vigor and very heavy tonnage and it is a very strong ratooner. It is resistant to drouth and is particularly adapted to the red shale hills of the interior and to the red coral lands of the north coast. It is comparatively low in sucrose and is very late in maturing. It is this latter feature in particular that has made it so unpopular with the mills that some of them refuse to receive it. Occurring as it usually does in mixed plantings, it is almost always cut too green and comes to the mill with very little available sugar. Analyses of 12-month ratoons made at the Station in February 1913 show as little as 6.77 per cent sucrose and only 60.5 per cent purity. Such cane is evidently valueless and it is a folly to cut it and send it to the mill. This only emphasizes the necessity for separating the varieties in pure cultures so that each

may be cut when fit to grind. In the tests at this Station published in Circular 8, 1917, it stood second in a total tonnage for three cuttings out of 25 kinds, being only surpassed by D-625.

	Total ton 3 cut.	Brix.	Sucr.	Purity
Cavengerie .....	121.43	16.77	12.45	75.3
D-625 .....	139.75	15.26	11.59	73.1
Cristalina .....	77.62	16.60	15.02	90.5

There is nothing in this report to indicate the stage of maturity at which these canes were cut. Evidently both Cavengerie and D-625 were quite green, still their tonnage was so much greater than Cristalina that the total yield of sugar per acre was much greater. At Fajardo in crop of 1918-19 this cane as second ratoons gave a yield of 48.75 tons cane and 4.64 tons sugar per acre. Only one other analysis is available.

5-6-21	Age	Arrows	Extr.	Brix.	Sucr.	R. S.	Purity
Cavengerie .....	Pl. 17 mo.....	No	66.6	18.17	16.02	1.23	88.20
Cristalina .....	Pl. 17 mo.....	No	65.1	19.55	18.93	.241	96.82

The considerable percentage of reducing sugar shows that the Cavengerie even at this age was still immature.

It seems clear that a cane having such vigor and being so well adapted to conditions where other kinds fail should not be discarded, as is being so frequently urged, until its adaptability to the needs of Porto Rican agriculture is much more fully tested. Most certainly it should not be planted in mixed cultures. *Gran cultura* should not be cut under 18 months. Late spring plantings and late ratoons should be carried over as *caña quadada* until the second season. Handled in this way, this cane will doubtless be more profitable on high, dry lands than the richer kinds now usually planted.

This cane is exceedingly susceptible to mosaic and is often killed outright when attacked. It is quite resistant to the ordinary forms of root disease and so ratoons freely for many years. It is however, freely attacked by the vascular bundle fungus. In fact, this parasite was first detected in this kind. One of its chief merits at the present time is its strong resistance to gum disease. It is not absolutely immune, since stalks have been found with a few vascular bundles infected, but for all practical purposes it may be considered so. It is this cane which saved the sugar industry of Brazil when the gum disease first appeared in that country about 1850, and it is still the

variety principally grown there, though unfortunately usually known under the name of Lousier.

A variant with white stripes in the leaves is not infrequent. In some fields quite a proportion of the plants show this character. Three other variants also occur for which the following names were proposed by Earle for the first time: Cavengerie Negra, Cavengerie Rayada, Cavengerie Roja.

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**Cavengerie Negra.**

(= Caña Negra, local name; probably = Cheribon of Queensland.) Frequently found with the typical form in all parts of the Island. It shows no striping but is a uniform dark reddish brown that well justifies the local name of black cane. It has been brought into the Station cultures as X-19 and X-26 by Earle, but is not yet sufficiently tested to know whether it differs from the typical form in anything except color. It seems to have been the "Black Tanna" mentioned in some of the early records of the Station. The following analyses are available:

		Arrows	Extr.	Brix.	Sucr.	Red sug.	Purity	Fiber	Age
1-21-21.....	Cav. Negra (X-19)....	No	70.8	16.10	12.61	2.14	78.82	11.88	14 mo..
1-21-21.....	Cristalina.....	No	70.0	17.25	15.96	0.87	92.52	9.60	14 mo..
3-3-21.....	Cav. Negra (X-19)....	No	72.4	18.00	15.58	1.20	86.55	12.14	16 mo..
5-4-21.....	Cav. Negra (X-19)....	No	68.4	17.20	16.28	1.09	89.45	.....	18 mo..
5-6-21.....	Cav. Negra (X-26)....	No	72.1	19.87	17.51	1.08	88.12	.....	18 mo..
5-6-21.....	Cristalina.....	No	65.1	19.55	18.93	2.41	96.82	.....	18 mo..

**Cavengerie Rayada.**

Found once in Yabucoa and brought into the Station cultures as X-11 by Earle. It differs from the typical form in having light-green instead of bronze stripes on the stalks.

**Cavengerie Roja.**

(= Rosita, = Sangre de Toro, local names.) This occurs abundantly mixed with the typical form in all parts of the Island. It is of the same dark wine color as the type, but has no striping either on stalk or sheath. No difference in cultural characters have been observed. It is quite possible that the Salangore Roja of Stahl and López Tuero belongs here.

## THE CHINESE OR SO-CALLED "JAPANESE" CANES

This is the group of thin, prolifically stooling canes, with closely adhering leaf sheaths and narrow, dark-colored leaves, of which Uba is the outstanding variety, although Jeswiet classifies the latter as a distinct species. These varieties of this type were listed by Mr. C. A. Barber, in his exhaustive and careful study of their morphological characteristics, as the Pausahi group of Northern India and have been erroneously termed in the literature as cane of the North Indian type, although it now appears that they are not by any means indigenous there and that we are justified by their characters and habitat in accepting Brandes's & Klaphaak's classification of them as Chinese canes. They constitute a considerable proportion of the cane grown in India, China, Japan, Formosa and Natal and, since the Mosaic-Disease outbreak in Porto Rico in 1917, *Kavangire*, imported from the Argentine Republic, where it in turn had been imported from Brazil, has come to be quite widely cultivated on the west coast of the Island.

Until recently, practically all of this group were considered immune to mosaic disease after Earle's classic immunity experiments in Santa Rita, in which this type of cane proved to be the only variety which did not take the disease. Brandes & Klaphaak in 1925 mentioned, however, that the group was not homogenous with respect to susceptibility to Mosaic and reported that Tekeha, Yontan-san, Khera, Kikaigashima, Chieueha and Chikusho were slightly susceptible. Shortly afterwards the writer and Mr. W. C. Dreier found the Japanese canes, imported from Cairo, Georgia, through the courtesy of Dr. P. A. Yoder of the Bureau of Plant Industry, rather heavily infected and only recently Dr. Yoder has found that every one of these varieties occasionally takes the disease to some extent, hence our term "Mosaic-immune cane" must be dropped. All of these varieties take the disease to such a small extent and are so tolerant of it that they may be considered as practically immune and the discovery of their occasional susceptibility does not in the least affect their usefulness in districts of established Mosaic infection, but it does emphasize the danger of importing the disease into uninfected sections through the bringing in of these heretofore supposedly immune types.

As a group all of these varieties are remarkably tolerant of the root disease complex, but in other countries, such as Queensland, they are subject to injury by smut and red rot (*Colletotrichum falcatum*). The pollen of this prolifically flowering group is to a large degree degenerate and it is, for this reason, impossible to secure self-





NO. 1 - CAYANA NO. 10

NO. - 2 UBA

NO. 3 - ZWINGA



fertilized seedlings, but, as Brandes & Klaphaak point out, hybrids are readily obtainable by using the pollen from varieties of certain other groups.

After months of careful study by the writer and Mr. Luis Serrano, we have come to the conclusion that the different varieties of this group are almost indistinguishable botanically, a conclusion concurred in by Mr. F. S. Earle, who has done considerable work with the Chinese canes. There are certain slight differences in some of the varieties which seem to be fairly constant in field study, but identification of canes sent in for that purpose is well-nigh impossible. The following descriptions will be found to vary very slightly, but they are given for what they are worth, with an expression of regret that we were not able to discover more salient and constant determining characteristics.

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YODER, P. A.—Rare Cases of Mosaic Disease in Highly Resistant Varieties of Sugar Cane. U. S. Dept. Agr. Circ. 392. July, 1926.

\*Cayana. See Plate XIX, opposite page 149; also Plate IV, opposite page 215.

In November, 1919, some cane cuttings were received by Mr. Earle under the name of Biloxi from the late S. M. Tracy of Biloxi, Miss., U. S. of A. In the letter accompanying them he said:

"I consider this the best of the Japanese canes, of which I have several. It is much larger and stronger than the others. Syrup growers in the neighborhood to whom I have given it think it the best cane they have grown. I have lost the name, so I call it Biloxi."

Erect very vigorous, a strong stooler. It arrows, but less freely than Uba. Stalks long, slender,  $1\frac{3}{4}$  to  $2\frac{1}{2}$  cm., green, usually with a lilac flush, considerable bloom. Internodes long, reaching as much as 15 cm., tapering, slightly larger below, furrow none. Nodes conspicuously enlarged; growth ring nearly 2 mm. wide, even or slightly sunken, greenish, root band swollen, 10 to 12 mm. wide, green or tinted; rudimentary roots large, the centers brown, in 3 rows; glaucous band about 10 mm. poorly defined, tapering sharply, the base being the narrowest part of the stalk; circle of hairs below the bud scanty, soon deciduous. Bud ovate, plump, rather obtuse, about  $10 \times 12$  to 14 mm., at first not exceeding the growth ring, margin

medium width, uniform, germination subdorsal, base glabrate, sides and apex with long appressed hairs. Leaf sheaths with scanty vestiture which is more abundant toward the margins. green, scarcely glaucous; throat sparingly lannate, no long hairs except scanty tufts at margins; collar narrow, inconspicuous, not reaching the midrib, glaucous but not lannate, ligule broad with a triangular widening at center where it reaches 5 mm., margin fimbriate; ligular processes none. Leaf blades spreading, flat, narrow,  $4\frac{1}{2}$  cm. dark green, minutely but sharply serrulate to the base, not ciliate.

This cane is very much like Uba and Zwinga but promises to be even more vigorous and productive. It may be distinguished from Uba by the uniformly swollen nodes, by the vestiture of the leaf sheaths and by the plumper buds, which germinate subdorsally, not apically as in the other two kinds. It resembles Zwinga more closely than the Uba, since both have swollen nodes and vestitures on the leaf sheaths, but they may be distinguished by the buds. In young plantings the first shoots of this cane are erect, not strongly inclined as with Uba.

The following analyses have been made:

		Arrows	Extr.	Brix.	Sucr.	Red sug.	Purity	Fiber
1-12-21.....	Biloxi.....	No	60.7	16.65	13.51	1.71	81.14	14.24
1-12-21.....	Cristalina.....	No	70.0	17.25	15.96	0.87	92.52	9.60
2-11-21.....	Biloxi.....	No	87.8	17.10	14.37	0.72	84.08	18.52
2-11-21.....	Biloxi.....	Yes	66.6	17.40	14.71	1.04	84.54	14.02
2-11-21.....	Rayada.....	No	68.6	17.15	15.35	0.81	88.92	12.37
4-11-21.....	Biloxi.....	No	66.7	17.90	16.16	0.897	90.27	12.02
4-11-21.....	Cristalina.....	No	70.1	18.10	16.92	0.265	98.48	10.47
4-27-21.....	Biloxi.....	No	65.5	20.20	17.50	0.987	86.68	11.04

These figures indicate that at full maturity it develops a satisfactory percentage of sucrose and purity. It seems to be fully equal to Uba in this respect and to promise even heavier tonnage.

It is practically immune to Mosaic. Yoder having found a slight infection in Georgia.

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**Japanese.**

Received from Dr. P. A. Yoder, Bureau of Plant Industry, Cairo, Ga., in April, 1925. Has been planted out in comparative tonnage experiment with some ten other canes of this type, but there has not as yet been sufficient time to obtain any information as to its value in Porto Rico. Yoder states that this is the cane which has been grown for many years in the Gulf States for forage and syrup and calls it "Old Small Japanese". "It is decidedly more slender in stalk and leaves and the joints are more enlarged than any of the other varieties here discussed."

Erect, fine vigor, stools prolifically, arrows freely. Stalks long and excessively slender, green with waxy deposit, giving bluish tint. Internodes long, cylindrical, but enlarged at base, not staggered, no furrow. Nodes enlarged, parallel; growth ring medium width, even, green to concolorous; root band wide and prominent, nearly parallel; light green to concolorous; rudimentary roots large, few and scattered, 2-3 in rows, inconspicuous and prominent, brownish; leaf scar glabrate and appressed behind; glaucous band inconspicuous, tapering from prominent root band to girth of internode. Buds small to medium size, 7-9 mms., scarcely exceeding growth ring, ovate to oval, germination subapical to subdorsal, margins narrow and on upper half only, lannated, no basal plac, tendency to premature sprouting. Leaf sheaths closely adherent, with scanty deciduous dorsal vestiture of coarse white hairs, light green, slightly glaucous, inner base slightly tinted with purple; throat indistinct, glabrate, few straggling hairs at margins, glaucous; collar narrow, inconspicuous, reaching midrib, glaucous; ligule narrow at sides and abruptly enlarged at center, acute apex; ligular process none. Leaf blades spreading with declining tips, narrow, 4-6 cms., dark green, margins minutely serrulated almost to base, sparse basal ciliation.

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**Japanese Fodder.**

See Zwinga.

**"Java Unknown".**

Received in 1922 from Mr. D. W. May, Agronomist in charge of the Federal Experiment Station at Mayagüez, under this name,



although at first glance it is evidently a Chinese cane. It appears, according to Saldaña, that:

"At this (Mayaguez) Station, several years ago, we received a cane of this type, presumably from Java. In growing this, it showed certain evidences of being superior to the Uba. We entered this in our records as E. K. 28, having received some cuttings of that variety in the same mail from Java, but . . . it is entirely different. So far we have not been able to determine where this cane came from."

Erect, fine vigor, stools prolifically, seldom arrows. Stalks long and excessively slender, green with waxy deposit giving bluish tint. Internodes long and cylindrical but enlarged at base, not staggered, no furrow. Nodes enlarged, parallel; growth ring medium length, slightly elevated, green to concolorous; root band wide and prominent, nearly parallel, concolorous; rudimentary roots large, few and scattered, 2-3 in rows, inconspicuous, concolorous; leaf scar glabrate, appressed behind; glaucous band inconspicuous, tapering from root band to girth of internode. Buds, small to medium size, 7-9 mm., premature, scarcely exceeding growth ring, ovate, germination subapical, margins narrow and on upper half only, lannate, no basal plates. Leaf sheaths closely adhering with scanty deciduous dorsal vestiture of white hairs, light green color, slightly glaucous; inner base slightly tinted with purple; throat indistinct and very scantily lannate; collar narrow, inconspicuous, reaching midrib, glaucous; ligule narrow at sides and abruptly enlarged at center; ligular process none. Leaf blades spreading with inclined tips, narrow, 4-6 cms, dark green, margins minutely serrulated almost to base, sparse basal ciliation.

Saldaña goes on to say in regard to this cane:

"Being unable to identify this cane, we have called it 'Java Unknown'. The main differences from the Uba are: It has double buds, it germinates better, is more vigorous and has darker green leaves, not possessing the whitish discolorations found on other canes of this type which are sometimes mistaken for mosaic. Its main qualification, however, is the fact that it defoliates easily and this ease of stripping gives it a great advantage over the Uba cane. In a measurement of a number of stalks the Java Unknown had an average diameter of 2.10 centimeters and an average height of 8.17 feet. The Uba had an average diameter of 2.15 centimeters and an average height of 7.7 feet. In our experiments, growing the two side by side, the Java Unknown yielded a greater tonnage of cane and sugar per acre. The average weight of stools of the Java Unknown was 91.77 pounds, for the Uba 81.18. The calculated tonnage per acre was Java Unknown 55.52, Uba 49.12. These results were obtained on cane planted at a distance of 6 X 6 feet and 17 months old. Another point of superiority of the Java Unknown over the Uba is that the latter arrows freely when 10 up to 20 months old, depending on the time of the year, while the Java Unknown does not arrow.



"In a comparative analysis of these two canes, beginning January 9th and lasting through a period of eleven weeks, extraction made on a Diamond grinding mill operated by horse power, the following averages were obtained:

	Brix	Sucro.	Purity	Extraction	Tons of cane per acre	Calculated tons of sugar per acre
Java unknown.....	18.38	14.45	78.60	55.61	55.52	5.334
Uba.....	17.75	14.55	82.36	57.79	49.12	5.019

"\* These calculations were based on an extraction of 76.79 for Uba and 74.61 for Java Unknown. These are the approximate extractions that these canes are giving in larger mills, Java Unknown is a little over 2 per cent lower in extraction than Uba.

"These results indicate that Java Unknown is a little lower in sucrose, purity and extraction but fine tonnage of cane and sugar per acre are much better than Uba. But the main factor is the ease in harvesting of the Java Unknown and especially the stripping of the leaves. In making these analyses it was apparent that the sucrose content and purity of these canes were greatly influenced by rains. They were both lower when the samples were cut after rains and higher following periods of dry weather. This varied from 1 to 2½ per cent in sucrose content and indicated that where weather conditions can be followed in harvesting, it is best to do so."

The Mayagüez Station then goes definitely on record in recommending the "Java Unknown" to take the place of the Uba:

"... for the following reasons: Greater tonnage of cane and sugar per acre, more vigorous, darker green leaves, better stooler and non-arrowing habit, but above all because of the ease of stripping leaves, which has been a great drawback with the Uba cane."

Unfortunately, with the exception of the facts that it is a better germinator and does not flower at so early an age as the Uba, *although it does flower abundantly when past a year or so of age*, we have been unable in four years of experience with this variety at the Experiment Station and on the Hatillo Fruit Farm near there, at both of which places we have had "Java Unknown" planted in comparative lots with Kavangire and Cayana, to verify any others of the points of superiority enumerated for this cane in the Mayagüez Station recommendations that it replace the Uba on the west coast—in fact, on account of its excessive thinness, particularly as ratoons when it resembles Johnson Grass in thickness (Saldaña's measurements show that its average girth is 33½ per cent less than that of Uba), and because the leaf sheaths *do* adhere to the stalk as in the case of other members of this group, we have found it a much harder cane to handle than the Uba, an experience which has been borne out by Mr. W. C. Dreier and other growers on

the north coast. We frankly see no chance of this variety supplanting the Uba cane.

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 SALDAÑA, J. A.—Agricultural Notes, No. 3. Published by the P. R. Agr. Expt. Sta., Mayagüez, Office of Farm Management, San Juan. 15th May, 1924.

\* *Kavangire*. See Plate IV, opposite page 215.

Originally and unsolicitedly sent by Mr. Geo. L. Fawcett, Botanist of the Tucumán Sta., Argentine, to D. W. May, Director of the Federal Station at Mayagüez in 1915, while the writer was Director of that Station. A further importation of 10 tons of seed was made from the Argentine in 1920 by the United States Department of Agriculture as an aid in combating the outbreak of cane mosaic in Porto Rico, after Mr. Earle had definitely established its practical immunity to this disease. It is now widely disseminated and is being grown on a large scale in many parts of the Island but more particularly on the west coast.

Erect, very vigorous, stools tremendously, arrows early and very freely. Stalks very tall, slender, average about 2 cm. in diameter, green, often with lilac tint, medium heavy bloom. Internodes long, 10 or 12 to 16 or 18 cm. cylindrical or slightly larger below, furrow none. Nodes normally of same diameter as internode, occasionally the lower one enlarged; growth ring rather wide, 3 to 4 mm., even or slightly sunken, concolorous or nearly so: root band slightly oblique, 7 to 9 mm., concolorous or yellowish, usually even, occasionally swollen on the lower nodes; rudimentary roots large, crowded, yellowish, in about 3 rows; glaucous band indistinct, blending with the bloom of the internode, circlet of hairs below bud present but scanty and soon deciduous. Buds ovate, obtuse, about  $10 \times 14$  mm., exceeding the growth ring by one-fourth of length. Margin narrow, uniform, about  $1\frac{1}{2}$  mm., germination apical, glabrate below, but with inconspicuous appressed hairs on the margins. Leaf sheaths soon glabrate, greenish, scarcely glaucous; throat sub-glabrous, the vestiture reduced to a few short hairs on the shoulders; collar narrow, reaching the midrib, glaucous; ligule with an abrupt triangular widening at center, where it reaches 4 to 5 mm., the ends 1 to 2 mm., margin irregular; ligular processes none. Leaf blades numerous, spreading, narrow, 3 to 5 cm., minutely but closely serrulate to the base.

This cane came originally from India at an early day to Brazil.

From there it was carried in 1869 to Mauritius under the name of Uba. Later it went from Brazil to Argentina, this time under the name of Kavangire, and from the Argentine it has now come to Porto Rico. Uba is today practically the only cane planted in Natal and other parts of South Africa. It is not extensively planted in Argentina on account of danger from frost, since there it is considered late in maturing although in favorable seasons it gives very heavy yields. It is a typical representative of the Chinese canes, some of which have also gone to Japan where they are extensively cultivated. The close resemblance of the Uba to these Chinese canes has led to its being also called a Japanese cane, but to the best of our knowledge it has never been grown in Japan. This class of canes are very distinct from those in general cultivation. They have such vigor and such great stooling power that they yield very heavy tonnage, notwithstanding their slender diameter. They grow well on a great variety of soils and are exceedingly resistant to root disease in all of its forms. Their preeminent characteristic is, however, their almost complete immunity to mosaic. It is this, of course, that is attracting such wide attention to these canes in Porto Rico. The reaction to gum disease has not been determined, but it is highly probable that they will prove to be resistant. These canes have been considered to be poor in sucrose and late in maturity. In Natal they are not considered to be at their best under 19 months. The results obtained here so far have been unexpectedly favorable. Kavangire seems to be decidedly better than either of the other two canes of this class so far thoroughly tested (Cayana and Zwinga). As will be seen by the following analyses it has more than once given more sucrose than Cristalina from the same field. This was certainly not expected and especially so early in the season. It must be noted, however, that these high analyses are all canes from hill lands where canes tend to mature early. The canes that have not arrowed, too, seem much slower in maturing. Kavangire has already taken an important place in commercial production in Porto Rico, particularly on the West Coast. In any event its introduction and testing on so large a scale constitutes one of the most interesting incidents in recent sugar-cane history, and this Island owes a debt of gratitude to the Federal Department of Agriculture for its prompt initiative in importing this seed. It is certain that the serious outbreak of mosaic disease on the west coast was easily and quickly dominated by the use of this variety. Now that this is accomplished its cultivation can be discontinued if other varieties prove more profitable such as P.O.J.-36 or D-1135.

## ANALYSES, STATION CANES, RED HILL LANDS

Kind	Date	Age	Arrows	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
Kavangire	12-6-20	Rat. 13 mo.	Yes	60.4	18.01	15.04	1.88	83.55	12.80
Cheribon (1)	.....	.....	No	.....	.....	13.69	1.67	85.88	12.29
Kavangire	1-10-21	Rat. 14 mo.	Yes	62.5	18.25	16.16	0.82	89.54	13.50
Cristalina	1-10-21	Rat. 14 mo.	No	71.4	17.30	15.84	0.64	86.67	12.01
Kavangire	1-5-21	Pl. 15 mo.	Yes	64.0	18.91	16.82	0.73	89.47	13.66
Cristalina	1-5-21	Pl. 15 mo.	No	66.6	16.96	15.35	0.56	90.54	11.35
Kavangire	12-24-20	Pl. 15 mo.	Yes	60.0	16.28	13.43	0.71	82.59	15.20
Cristalina	12-24-20	Pl. 15 mo.	No	65.7	18.88	17.08	0.52	90.65	13.72
Kavangire	2-7-21	Pl. 17 mo.	Yes	61.1	17.18	15.83	0.40	88.93	14.00
Kavangire	2-7-21	Pl. 17 mo.	No	63.8	15.15	13.16	0.95	84.90	13.03
Cristalina	2-7-21	Pl. 17 mo.	Yes	65.2	18.40	17.27	0.65	93.85	11.83
Cristalina	2-7-21	Pl. 17 mo.	No	68.6	17.90	16.14	0.805	90.16	13.81
Kavangire	2-23-21	Pl. 17 mo.	No	68.5	17.50	15.93	0.399	90.02	13.86
Kavangire	2-23-21	Pl. 17 mo.	Yes	64.1	17.90	16.26	0.43	90.83	14.86
Kavangire	4-4-21	Pl. 18 mo.	No	64.5	18.30	18.53	1.06	84.86	12.67

(1) Average 5 lots canes.

## ANALYSES, OTHER LOCALITIES

Mayagüez	.....	.....	.....	.....	.....	.....	.....	.....	.....
Station (1)	1-1919	Pl. 16 mo.	.....	.....	.....	12.2	.....	81.23	.....
Central	.....	.....	.....	.....	.....	.....	.....	.....	.....
Guánica (2)	12-18-20	Plant	.....	78.42	13.17	10.59	1.76	77.31	.....
Central Guánica	.....	.....	.....	.....	.....	.....	.....	.....	.....
D-117 (3)	12-18-20	Plant	.....	.....	15.72	13.24	.....	84.22	.....
Hatillo Fruit Co.	1-28-21	Pl. 15 mo.	No	66.6	14.65	13.74	0.79	83.61	13.36
Hill land	.....	.....	.....	.....	.....	.....	.....	.....	.....
Central Vannina	.....	.....	.....	.....	.....	.....	.....	.....	.....
Hill land	1-22-21	Pl. 15 mo.	.....	.....	19.25	17.19	.....	89.09	.....
Hill land	2-4-21	Pl. 16 mo.	No	65.3	18.20	15.89	0.95	87.30	13.88
Dayamón	2-9-21	.....	.....	.....	15.65	11.89	0.99	75.97	.....
Mayagüez	2-10-21	.....	.....	62.59	16.15	13.85	0.466	85.75	.....
Utado	2-19-21	.....	.....	.....	17.00	12.32	.....	72.47	.....
Arecibo	2-18-21	Pl. 10 mo.	No	.....	14.5	9.32	2.52	64.27	.....

(1) Yield estimated at 83.56 tons per acre.

(2) Tons per acre, 44.75 tons sugar, 3.716.

(3) Tons sugar per acre, 5.509.

## REFERENCES

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- ROSENFELD, ARTHUR H.—Kavangire: Porto Rico's Mosaic Disease-Resistant Cane. Int. Sugar Jour., XXII, pp. 26-33. 1920.

## Khera.

Received from Dr. P. A. Yoder, of the Office of Sugar Plant Investigations, U. S. Bureau of Plant Industry, Cairo, Ga., in April, 1925. Has been planted in comparative tonnage experiments with some ten other canes of this type, but there has as yet been insufficient time, naturally, for obtaining any definite idea as to its value in Porto Rico. It was obtained originally by the Office of Foreign Seed and Plant Introduction from Aligarh, United Provinces, India, in 1912.







MERTHI



C. H. 64 (21)

Erect, fine vigor, stools prolifically, arrows freely. Stalks long and excessively slender, green and purple with black waxy covering, some flush. Internodes long, cylindrical but enlarged at base, slightly staggered, no furrow or only slight trace. Nodes enlarged, parallel; growth ring medium width, even, green to concolorous; root band wide and prominent, nearly parallel, white to concolorous; rudimentary roots large, few and scattered, 2-3 in rows, prominent, brownish; leaf shear glabrate, appressed behind; glaucous band inconspicuous, tapering from prominent root band to girth of internode. Buds, small to medium size, 7-9 mms., exceeding growth ring by one-third to one-half, ovate, germination subapical, margins narrow and on upper half only, lannate, no basal plaes, tendency to premature sprouting. Leaf sheaths closely adherent with scanty, deciduous, dorsal vestiture of short, white hairs, light green, slightly glaucous; inner base slightly tinted with purple; throat inconspicuous, glabrate, with few straggling hairs at margins, glaucous; collar narrow, inconspicuous, reaching midrib, glaucous; ligule narrow at sides and abruptly enlarged at center, acute apex; ligular process none. Leaf blades spreading with declining tips, narrow, 4-6 cms., dark green, margins minutely serrulated almost to base, sparse basal ciliation.

## REFERENCES

See under Japanese.

**Merthi.** See Plate XX, opposite page 157.

This is identical with Uba, *q. v.* The planting of this variety which we have at the Insular Station is a type selected for the past eight years by Mr. J. R. Zell, of Finca "El Conde", Cent. Hershey, Cuba, who calls it "Merthi-Zell's Strain", and sent it to Commissioner Carlos E. Chardón in September, 1925. Mr. F. S. Earle, of the Tropical Plant Research Foundation staff in Cuba, wrote the author on 11th June, 1926, in regard to this cane as follows:

"I had no true Merthi in this field, but at another place it has run much lower than Uba all season. I don't know why, for I confess that I cannot tell them apart. Whether or not Zell has permanently improved his strain by eight years of selection I do not know. I incline to think that he has. A number of plantations are going in for it on a large scale.

In sending the author the subjoined series of analyses, Mr. Zell wrote under date of 28th November, 1925:

"I cannot have an opinion as to the ultimate value of this strain for Porto Rico because conditions, not only of soil and climate, but, also, of mode of working are so radically different from what is the case here in Cuba; however,

it may have a place for which it may be particularly adapted—some type of soil of some exceedingly dry section where soil is thin and poor, etc., etc., that your study of the variety will bring out. May I observe that in considering the analyses which I have sent it should be borne in mind that this year has been one exceptionally dry for Cuba. This has brought about a condition which, in my opinion, favors this cane greatly by checking its eternal propensity and ABILITY to keep on growing when this is at all possible. Of course, when it once reaches maturity it will stop growing—but that won't be until it is 22 months old or older, from what I have noticed, hence it will be very important that it be allowed to go to fullest maturity for best results. The records of analyses which I sent were made in a year in which the crop as a whole is 25 to 40 per cent short due to lack of rain. . . The lack of rain noted has favored the cane referred to, so this should be borne in mind in judging its qualities. . . . My experience has been that the deeper it is planted, the better, as, otherwise, it puts out too many suckers and the canes are liable to be much thinner than if planted deep. Also, every time I plant I discard all canes with swollen or too prominent eyes or buds, aerial roots, short internodes and thin canes. When I first got this cane several years ago it was a sorry looking thing, but the percentage of respectable canes has increased wonderfully while the other class has been on the decrease and this to such an extent that now I have many stools which are nearly all good canes."

**CANES CUT AT "EL CONDE" IN HABANA PROVINCE AND SENT TO CENTRAL "CARACAS" TO E. KOWALT, FOR ANALYSES**

(X) Arrowed November 1924.

(=) Not arrowed.

All Merthi planted November 1923.

Date cut and sent	Date analyzed	Variety	Hand-mill work			Calculated to actual mill work			
			Brix.	Sucr.	Purity	Brix	Sucr.	Purity	Sac. cane
1925	1925								
10-22	10-25	Merthi Z. strain (X) . . .	16.65	14.58	87.60	16.15	12.86	79.60	10.80
10-22	10-25	Merthi Z. strain (=) . . .	18.75	17.30	92.30	18.19	15.83	84.30	12.88
10-22	10-25	CH-64 (21) . . . . .	15.80	12.96	82.00	15.33	11.34	74.00	9.53
10-22	10-25	C 558 . . . . .	16.50	14.27	86.50	16.00	12.56	78.50	10.56
10-22	10-25	C-35 . . . . .	16.25	13.88	85.40	15.75	12.19	77.40	10.24
10-22	10-25	Crystalina . . . . .	15.20	12.74	83.80	14.70	11.14	75.80	9.86
10-29	11-1	Merthi Z. strain (X) . . .	17.9	16.08	89.5	17.4	14.18	81.5	11.91
10-29	11-1	Merthi Z. strain (=) . . .	17.6	14.24	80.9	17.0	12.89	72.9	10.40
10-29	11-1	CH-64 (21) . . . . .	18.9	17.01	90.0	18.3	15.0	82.0	12.60
10-29	11-1	C 558 . . . . .	17.9	14.12	78.8	17.4	12.32	70.8	10.35
10-29	11-1	Crystalina . . . . .	19.9	18.35	92.20	19.3	16.42	84.2	13.79
11-5	11-8	Merthi Z. strain (X) . . .	16.0	13.06	81.6	16.0	11.78	78.6	9.90
11-5	11-8	Merthi Z. strain (=) . . .	20.7	18.98	91.7	20.7	17.82	83.7	14.55
11-5	11-8	CH-64 (21) . . . . .	15.2	11.39	75.0	15.2	10.18	67.0	8.56
11-5	11-8	C 558 . . . . .	19.2	16.53	85.6	19.2	14.90	77.6	12.52
11-5	11-8	Crystalina . . . . .	18.4	16.72	90.9	18.4	15.25	82.9	12.81
11-12	11-15	Merthi Z. strain (X) . . .	19.9	18.25	91.7	19.3	16.15	83.7	13.57
11-12	11-15	Merthi Z. strain (=) . . .	19.4	17.65	91.	18.8	15.60	82.	13.10
11-12	11-15	CH-64 (21) . . . . .	16.9	13.44	79.50	16.4	11.73	71.5	9.85
11-12	11-15	C 558 . . . . .	17.	13.83	81.4	16.5	12.11	73.4	10.17
11-12	11-15	Crystalina ratoon . . . .	19.9	18.4	92.5	19.3	16.81	84.5	13.07
11-12	11-22	Merthi Z. strain (X) . . .	17.	15.02	88.30	16.5	13.25	80.80	11.13
11-19	11-22	Merthi Z. strain (=) . . .	18.9	17.15	90.80	18.3	15.55	82.80	12.72
11-19	11-22	CH-64 (21) . . . . .	12.9	14.79	82.60	17.4	12.98	74.6	10.90
11-19	11-22	C 558 . . . . .	18.7	15.43	82.50	18.10	13.48	74.5	11.32
11-19	11-22	Crystalina ratoon . . . .	17.80	15.26	88.20	16.8	13.47	80.2	11.31

"Merthi" from canes planted November 1923.

Crystalina is from second ratoons about 20 months old in October 1925.

Other varieties are from plant cane 21 to 22 months old in October 1925.

The following letter was sent to Mr. Zell from Central Jatibonico:

A. V. Switzer,  
Central Jatibonico.  
Prv. Camagüey, Cuba.

NOVEMBER 2, 1925.

MR. J. B. ZELL,  
"El Conde",  
Prv. Havana.

DEAR SIR:

I regret that I have not answered your letter of September earlier, but time passed so fast and work here kept me on the go.

In regard to the "Merthi", I will say it is the best standing variety out of 23 which I have planted here in the experimental plot. Many of the stools are now having 40 to 45 shoots. Very few of the stools go below 25 shoots.

No signs of the mosaic disease have been noticed in the "Merthi", but in nearly all the others I have the disease.

As you mentioned in your letter, this cane is at its best when 18 to 20 months old. I am awaiting the time to see it then.

If you ever should make a trip over this way, I would be glad if you will stop off at Jatibonico and visit our plot here.

I am, sir, very respectfully yours.

(Signed) A. V. SWITZER.

Oshima.

Received from Dr. P. A. Yoder, Office of Sugar Plant Investigations, Bureau of Plant Industry, U. S. Department of Agriculture, Cairo, Georgia, in April, 1925. It was imported by the Section of Seed and Plant Introduction from Kagoshima Ken, Japan, through the Yokohama Nursery Co., in December, 1910. Has been planted out in comparative tonnage experiment with some ten other canes of this type, but there has not as yet been sufficient time to obtain any data as to its possible value in Porto Rico.

Erect, fine vigor, stools prolifically. arrows freely. Stalks long and excessively slender, green with wax covering giving bluish tint, becoming yellow with age, some flush. Internodes long, cylindrical, but enlarged at base, not staggered, no furrow, or only slight trace. Nodes enlarged, parallel; growth ring medium width, even, green to concolorous; root band wide and prominent, nearly parallel, concolorous; rudimentary roots large, few and scattered, 2-3 in rows, inconspicuous and concolorous; leaf scar glabrate, appressed behind; glaucous band inconspicuous, tapering from prominent root band to girth of internode. Buds, small to medium size,  $7 \times 9$  mms., scarcely exceeding growth ring, ovate, germination subapical, margins narrow and on upper half only, lannate, no basal plates. Leaf sheaths closely adherent, with scanty deciduous dorsal vestiture of short,



white hairs, light green, slightly glaucous, inner base slightly tinted with purple; throat inconspicuous, glabrate, with few straggling hairs at margins, glaucous; collar narrow, inconspicuous, reaching midrib, glaucous; ligule narrow at sides and abruptly enlarged at center, ligular process none. Leaf blades spreading with declining tips, narrow, 4-6 cms., dark green, margins minutely serrulated almost to base, sparse basal ciliation.

## REFERENCES

See under Japanese.

## SPI-33243.

S. P. I. denotes the Office of Foreign Seed and Seed Introduction of the U. S. Bureau of Plant Industry. This cane was obtained from Dr. E. W. Brandes, in charge of the Office of Sugar Plant Investigations, in May, 1924. It has been planted out in comparative tonnage experiments with some ten other representatives of this type, but there has been no time as yet to obtain definite data as to its possible utility on this Island.

Erect, fine vigor, stools and suckers prolifically. Stalks long and excessively slender, yellow to dark green, heavily coated with black bloom, no flush. Internodes long, cylindrical, slightly enlarged at base, not staggered, furrow slight to none. Nodes enlarged, parallel; growth ring medium width, even, green to concolorous; root band wide and prominent, nearly parallel, concolorous; rudimentary roots large, few and scattered, 2-3 in rows, inconspicuous and concolorous; leaf scar glabrate, appressed behind; glaucous band inconspicuous, tapering from prominent root band to girth of internodes. Buds small to medium size, 7-9 mms., prematurely sprouting, scarcely exceeding growth ring, ovate, germination subapical, margins narrow and on upper half only, lannate, no basal plaes. Leaf sheaths closely adherent, lannate dorsally, light green, slightly glaucous, inner base slightly tinted with purple; throat narrow and indistinct, scanty lannated; collar narrow and inconspicuous, reaching midrib, glaucous; ligule narrow and abruptly enlarged at center; ligular process none. Leaf blades spreading with declining tips, narrow, 4-6 cms., dark green, margins minutely serrulated almost to base, sparse basal ciliation.

## Tekcha.

Received from Dr. Yoder, Cairo, Georgia, in April, 1925. It was imported by the S. P. I. of the U. S. Bureau of Plant Industry from Japan, through the Yokohama Nursery Co. It has been planted out at the Station in comparative tonnage experiments with some ten



other representatives of the Chinese group, but there has as yet been insufficient time in which to form an idea of its value for Porto Rican conditions. Mr. F. S. Earle, Cane Technologist of the Tropical Plant Research Foundation, wrote the author from Cuba, under date of 11th June, 1926, in regard to this variety:

"Tekcha, here in my sandy *sabana* land, is leading the whole bunch in tonnage and is maturing marvelously, even being ahead of Kassoer. It is not too good in sucrose, but is better than Kassoer."

Erect, fine vigor, stools prolifically, arrows freely, takes mosaic. Stalks long and excessively slender, green with waxy deposit, giving bluish tint and becoming yellow with age. Internodes long, cylindrical but enlarged at base, not staggered, no furrow. Nodes enlarged parallel: growth ring medium width, even green to concolorous; root band wide and prominent, nearly parallel, concolorous; rudimentary roots large, few and scattered, 2-3 in rows, inconspicuous and concolorous; leaf sheath glabrate, appressed behind; glaucous band inconspicuous, tapering from prominent root band to girth of internodes. Buds, small to medium size, 7-9 mms., scarcely exceeding growth ring, ovate to oval, germination subapical to subdorsal, margins narrow and on upper half only, lannate, no basal plaes. Leaf sheaths closely appressed with scanty deciduous, dorsal vestiture of short, white hairs, light green, slightly glaucous, inner base slightly tinted with purple; throat indistinct, glabrate, with few straggling marginal hairs, glaucous; collar narrow and inconspicuous, reaching midrib, glaucous; ligule narrow at sides and abruptly large at center; ligular process none. Leaf blades spreading with declining tips, narrow, 4-6 cms., dark green margins minutely serrulated almost to base, sparse basal ciliation.

#### REFERENCES

See under Japanese.

**Uba.** See Plate XIX, opposite page 149.

This is the prototype of the Chinese canes and is the one which has attained such wide fame in Natal. It was obtained from Dr. P. A. Yoder, of the Bureau of Plant Industry at Cairo, Georgia, in April, 1925, for a comparative study of the *Kavangire* which is so widely planted on the west coast of Porto Rico. It was imported by the S. P. I. from Natal, through Pretoria, Transvaal, South Africa, in September, 1925. It has been planted at the Station in comparative tonnage experiments with *Kavangire* and a number of other representatives of the Chinese group, but there has as yet been insufficient time to form an idea as to its merits here.

Erect, fine vigor, stools prolifically, arrows abundantly. Stalks long and excessively slender, green with waxy deposit giving bluish tint, becomes yellow with age. Internodes long, cylindrical but enlarged at base, not staggered, no furrow. Nodes enlarged, parallel; growth ring medium width, slightly elevated, green to concolorous; root band wide and prominent, nearly parallel, concolorous; rudimentary roots large, few and scattered, 2-3 in rows, inconspicuous and concolorous; leaf sheath with occasional ciliation, appressed behind; glaucous band inconspicuous, tapering from root band to girth of internodes. Buds small to medium size, 7-9 mms., slightly exceeding growth ring, ovate, germination subapical, margins narrow and on upper half only, lannate, no basal plaes. Leaf sheaths closely adhering, with scanty deciduous, dorsal vestiture of white hairs, light green, slightly glaucous, inner base lightly tinted with purple; throat indistinct and very sparsely lannate; collar narrow; inconspicuous, reaching midrib, glaucous; ligule narrow at sides and abruptly enlarged at center, ligular process none. Leaf blades spreading with declining tips, narrow, 4-6 cms., dark green, margins minutely serrulated almost to base, sparse basal ciliation.

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 CALVINO, EVA MAMELI DE—Caracteres Peculiares de las Cañas Uba, Cayana No. 10, Kavangire y Japonesa o Zwinga. Chaparra Agrícola. I, 1, p. 22. May, 1924.

## Yon-Tan-San (Yontanzan).

Obtained from Dr. Yoder, Cairo, Georgia, in April, 1925. It was imported by the S. P. I. X. from Okinawa Ken, Kiushu, Japan, through the Yokohama Nursery Co., in June, 1910. It has been planted out in tonnage experiments with the other representatives of the Chinese group which we have at the Station, but there has as yet been insufficient time in which to form any idea of its value.

This variety was imported directly from Japan by the Tucumán Agricultural Experiment Station in Argentina in the year 1917. It was described by the Japanese authorities as an improved type from the Island of Lioo-Choo. Cross reported it in Tucumán as having a slightly larger stalk and less fiber than the other canes of this type and to also be easier to strip, but we have not been able to verify these characteristics.

Erect, fine vigor, stools prolifically, arrows abundantly. Stalks long and excessively slender, green with waxy deposit giving bluish tint. Internodes long, cylindrical, but enlarged at base, not stag-

gered, no furrow. Nodes enlarged, parallel; growth ring medium width, even, green to concolorous; root band wide and prominent, nearly parallel, green to concolorous; rudimentary roots large, few and scattered, 2-3 in rows, conspicuous, brownish; leaf scar with occasional ciliation, appressed behind; glaucous band inconspicuous, tapering from prominent root band to girth of internode. Buds small to medium size, 7-9 mms., slightly exceeding growth ring, ovate, germination subapical, margins narrow and on upper half only, lannate, no basal plac. Leaf sheaths closely adherent, with scanty deciduous dorsal vestiture of white hairs, light green, slightly glaucous, inner base lightly tinted with purple; throat indistinct and very sparsely lannated; collar narrow, inconspicuous, reaching midrib, glaucous; ligule narrow at sides and abruptly enlarged at center, ligular process none. Leaf blades spreading with declining tips, narrow, 4-6 cms., dark green, margins minutely serrulated almost to base, sparse basal ciliation.

## REFERENCES

- CROSS, W. E.—Estudios con Variedades de Cañas Importadas. *Revista Industrial y Agrícola de Tucumán*, XII, pp. 72-92. 1921.  
ROSENFELD, A. H.—Report of the Special Technologist for Cane. Annual Report of the Ins. Expt. Sta. of Pto. Rico. 1924-25.

\* *Zwinga*. See Plate XIX, opposite page 149.

(= Japanese Fodder.) Introduced from Luisiana by the Federal Station at Mayagüez. Date of introduction not known. It is now also in the plots at the Insular Station but has not been seen elsewhere in the Island. In the fall of 1919 the Federal Station brought some seed cane from St. Croix under the name of Kavangire. It was observed by the present writer to be distinct from the Kavangire brought from the Argentine and was thought to be *Zwinga*. This now seems doubtful. This St. Croix cane seems to more nearly resemble what is here called Cayanna than it does either Uba or *Zwinga*. Whatever its identity, small lots of it were somewhat widely distributed. It seems to be slower in ripening and poorer in sugar than the Uba.

Erect, very vigorous, heavy stooier, arrows infrequently. Stalks long, very slender, about 2 cm., green or ash-colored from the light bloom. Internodes long, 13 to 15 cm., straight, nearly cylindrical but usually larger below, furrow slight or none; nodes abruptly and conspicuously swollen; growth ring slightly sunken, 2 to 3 mm., broad, yellowish-green, conspicuous; root band abruptly swollen 10 to 12 mm. wide, concolorous; rudimentary roots large, crowded,

becoming prominent, concolorous, in 3 to 4 rows: leaf scar glabrous, closely appressed behind; glaucous band tapering rapidly, its lowest part being the narrowest part of the stalk. The circle of hairs below the bud is strongly developed. Buds ovate, about  $10 \times 12$  mm., exceeding the growth ring by one-fourth of length, margin uniform, medium narrow, germination apical, basal places of hairs poorly developed, abundant, long, appressed marginal hairs. Leaf sheaths with a distinct but short and somewhat deciduous vestiture which is usually more abundant on the sides than on the back, green, little or no bloom; throat minutely lannate but with no long hairs or sometimes scant marginal tufts; collar pale, indistinct, glaucous; ligule wide and with an abrupt triangular widening at the center where it reaches 5 to 6 mm., the edge fimbriate; ligular processes none. Leaf blades numerous, spreading, narrow,  $4\frac{1}{2}$  to 5 cm. bright green, very minutely serrulate.

This cane very closely resembles the Uba but may be distinguished by the more abundant vestiture on the leaf sheaths and the abruptly swollen nodes. In the Uba nodes and internodes are normally of the same diameter. The buds are flat and germinate apically as in Uba. This serves to distinguish it from Cayana which has plumper buds that germinate subapically or nearly subdorsally.

Like the Uba it is almost completely immune to mosaic and is exceedingly resistant to all forms of root disease. Its reaction to gum disease is not known, but it is probably immune.

This cane is extensively grown in the Southern States as a forage for cattle and it is considerably used there for syrup making. It probably has but little value for sugar making on account of its late maturity and low sucrose content. A few analyses are given:

Kind	Date	Age	Extr.	Brix.	Sucr.	Red. Sug.	Purity	Fiber
Zwinga.....	12-30-20	Pla. 13 mo..	66.6	15.13	11.78	1.96	77.85	9.35
Y. Cal. ....	12-30-20	.....	67.9	15.73	11.85	2.00	78.51	13.48

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- SPRINGS, W. C.—Sugar Cane. Field Experiments, Varieties. *La. Agr. Ex. Station, Bull. 2, N. S.*; Feb., 1924.



## THE COIMBATORE SEEDLINGS

These are the famous canes bred at the Coimbatore Experiment Station in India by Mr. C. A. Barber many years ago, those which are enumerated below having proven in recent years in India to be very resistant to drought, mosaic and root disease, characters inherited from their P.O.J. parents, and beginning to obtain wide distribution in the drier parts of India.

Co-210. See Plate II, opposite page 119.

Seedling of P.O.J. 213, male parent being Madras 2 or 1017. Sent to the Station in February, 1925, by Rao Sahib T. S. Venkatramen, Government Sugar Cane Expert of the Agricultural College of Coimbatore, South India. An extremely thin, sprawling cane very much resembling the Tucumán seedlings in small girth and enormous stooling characteristic. Mr. F. S. Earle wrote us from Herradura, Havana Province, Cuba, under date of 18th, August, 1925;

"Here Co-210, 213 and 214 are all fairly promising, with 213 decidedly best."

Mr. Wynne Sayer, Secretary of the Pusa Sugar Bureau in India, reports in the *International Sugar Journal* that—

"Co-210 is a good ratooner, Co-214 coming next to it, while Co-213 stands last when there is little rain."

Erect, good vigor and fine stooler. Stalks long and exceedingly slender, violet, overlain with heavy wax deposit, tendency to split. Internodes long, cylindrical, but slightly enlarged at base, not staggered, furrow trace to none. Nodes enlarged, parallel; growth ring wide, prominent, yellowish green; root band wide, parallel, white; rudimentary roots small, few and scattered, 2-3 in rows, inconspicuous, light purplish; leaf scar glabrate, appressed behind; glaucous band tapering, broad and inconspicuous. Buds large, 8-10 mms., ovate, exceeding growth ring by one-third, germination apical, margins broad and flat, abruptly shouldered above, apices purple, glabrate, no apical tufts, very light basal places. Leaf sheaths closely adherent, glabrate, no wax, tinted, inner base heavily splotched with purple; throat narrow, lannated, with short appressed hairs, long straggling hairs at margins; collar narrow, reaching midrib, glaucous; ligule medium width, 2-3 mms., at sides and becoming abruptly enlarged at center, flambrate, no ligular process. Leaf blades spreading with declining tips, narrow, 4-5 cms., dark



green with white midrib, margins minutely and uniformly serrulated, long ciliae at base.

No data yet available on behavior of this variety in Porto Rico, although in tonnage experiment planted out in fall of 1925, it shows a remarkable stooling quality.

#### REFERENCES

- SAKER, WYNNE.—Mill Trials of Coimbatore Sugar Cane Seedlings 232 and 233. *Agricultural Journal of India*, XIX, Pt. IV. 1924.  
*Idem.*—The Pusa Sugar Bureau Scientific Reports of the Agr. Res. Inst. of Pusa, 1923-4. Abridged in *International Sugar Journal*, XXVII, pp. 438-42. Aug., 1925.

#### Co-213.

Seedling of P.O.J. 213, male parent being Madras 2 or Kansar. Sent to the Station in February, 1925, by Rao Sahib T. S. Venkatramen, Government Sugar Cane Expert of the Agricultural College of Coimbatore, South India. An extremely thin, sprawling cane, very much resembling the Tucumán seedlings in small girth and enormous stooling characteristic. Mr. F. S. Earle wrote us from Herradura, Havana Province, Cuba, under date of 18th August, 1925:

“Here Co-210, 213 and 214 are all fairly promising, with 213 decidedly best.”

Erect, good vigor, fine stooler, yellow base color with abundant bluish wax deposit becoming flushed to violet and red on exposure to sun. Internodes long and enlarged at back, very slightly staggered, no furrow. Nodes nearly even, oblique; growth ring even, narrow and inconspicuous, concolorous; root band narrow, oblique, concolorous; rudimentary roots small, very few and scattered, 2-3 in rows, purplish, leaf scar glabrate and appressed behind; glaucous band slightly constricted, broad and conspicuous. Buds medium size. 7-9 mms., not exceeding growth ring, orbicular, germination dorsal, margins medium width, flat, uniform, glabrate, no apical tufts nor basal plaes. Leaf sheaths glabrate, no wax, tinted, inner base heavily splotched with purple; throat narrow, lannate, with short appressed hairs and long straggling hairs at margins; collar narrow, reaching midrib, glaucous; ligule medium width, 2-3 mms., at sides, becoming abruptly enlarged at center, flambrate, no ligular process. Leaf blades spreading with declining tips, narrow, 4-5 cms., dark green, white midrib, minutely and uniformly serrulated, some basal ciliation.

Mr. Wynne Sayer, Secretary of the Pusa Sugar Bureau in India, reports in the *International Sugar Journal* that—

“Co-210 is a good ratooner, Co-214 coming next to it, while Co-213 stands last when there is little rain.”

No data yet available on behavior of this variety in Porto Rico, although in tonnage experiment planted out in fall of 1925, it shows a remarkable stooling quality.

#### REFERENCES

- SAYER, WYNNE.—Mill Trials of Coimbatore Sugar Cane Seedlings 232 and 233. *Agricultural Journal of India*, XIX, Pt. IV. 1924.  
*Idem*.—The Pusa Sugar Bureau. Scientific Reports of the Agr. Res. Ins. of Pusa, 1923-4. Abridged in *International Sugar Journal*, XXVII, pp. 438-42. Aug., 1925.

#### Co-214.

Seedling of Striped Mauritius. Male parent probably a cross of Saretha with *S. spontaneum*. Sent to Station from Coimbatore by Government Sugar Expert Venkatramen in February, 1925. An extremely thin, sprawling cane—even more so than Co-210 and 213—closely resembling the Tucumán seedlings in type of growth and excessive thinness. Mr. Wynne Sayer wrote us from Pusa that it comes next to Co-210 as a good ratooner, while Mr. F. S. Earle, in a letter from Herradura, Province of Havana, Cuba, dated 18th August, 1925, reports it as “fairly promising”.

Recumbent, vigorous, good stooler, arrows early. Stalks long and excessively slender, dirty yellowish green, changing to purple on exposure to sun. Internodes medium length, cylindrical, slightly staggered, no furrow. Nodes swollen, parallel; growth ring medium width, very slightly elevated, light green to brown; root band wide, parallel, white; rudimentary roots small, few and scattered, prominent, yellowish; leaf scar glabrate, appressed behind; glaucous band narrow, very slightly constricted, inconspicuous. Buds small, 5-7 mms., not exceeding growth ring, orbicular, germination subdorsal, margins narrow, flat, on upper half only, abruptly enlarged at sides and concave at apex, no apical tufts nor basal plaes. Leaf sheaths glabrate, no wax, violet, inner base slightly tinted; throat narrow, indistinct, lannate, long tufts at margins; collar narrow, reaching midrib, glaucous; ligule narrow, 2-3 mms., becoming very much enlarged, 8-12 mms., at center and convex above and below; no ligular process. Leaf blades spreading with declining tips, narrow, 4-5 cms., dark green, white midrib, serrated to base, long basal ciliae.

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 Co-281.

This variety belongs to a later series of seedlings than the preceding one, Sayer, in his report on the Sugar Bureau of Pusa for 1923–24, giving the parentage of the Coimbatore seedlings only through Co-280, hence the ancestry of this variety is unknown to the writer, although its appearance strongly suggests P.O.J. blood. It was sent to us from Cuba by Mr. F. S. Earle, Cane Technologist of the Tropical Plant Research Foundation, who is most enthusiastic over its development in that country, in September, 1925. On 11th June, 1926, Mr. Earle wrote us as follows in regard to this cane:

“The only real discovery I have made this winter is the Co-281. It is making big tonnage, fully as much as Uba on most soils and is very early in maturing. At my first analyses in December it took first place out of over a hundred kinds with over 17 per cent sucrose and kept either first or second place until March.”\*

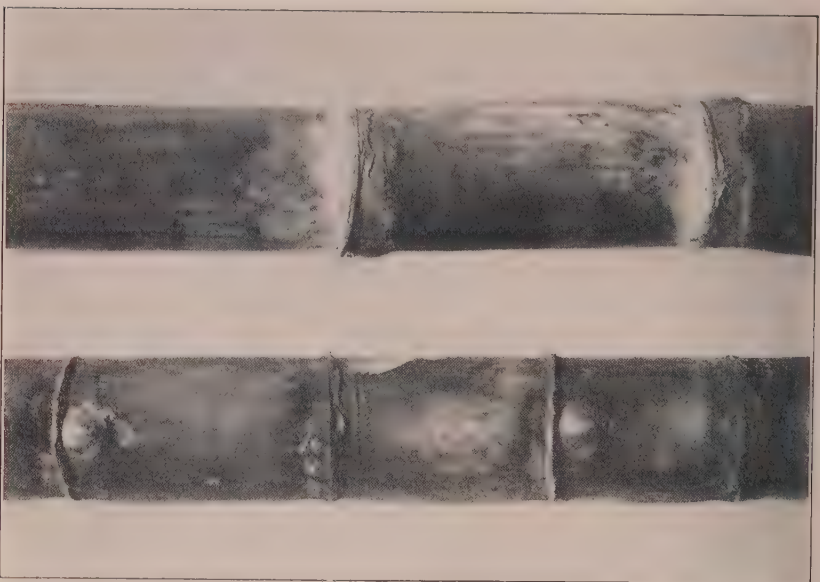
Erect, good vigor, splendid stooler. Stalks long, thin, wine colored, heavy bloom. Internodes long, cylindrical, very slightly staggered, no furrow. Nodes almost even, parallel; growth ring wide, 4–6 mms., slightly elevated, green changing to concolorous; root band wide, parallel, yellowish green to concolorous; rudimentary roots large, few and scattered, indistinct, 2–3 in rows, purplish to concolorous; leaf scar glabrate and appressed behind; glaucous band wide, distinct, slightly constricted. Buds medium size, 7–9 mms., broadly ovate, reaching growth ring, germination apical, margins very narrow, even, glabrate, on upper half only, no apical tufts nor basal plac. Leaf sheaths glabrate, glaucous, slightly tinted at outer base only; throat narrow split at sides, covered with black wax, short, scattered hairs at sides; collar narrow, reaching midrib, glaucous; ligule narrow at sides becoming abruptly convex at center, no ligular process. Leaf blades erect, with slightly declining tips, narrow, 5 cms., dark green, minutely and uniformly serrulated, no basal ciliation.

**Crema.**

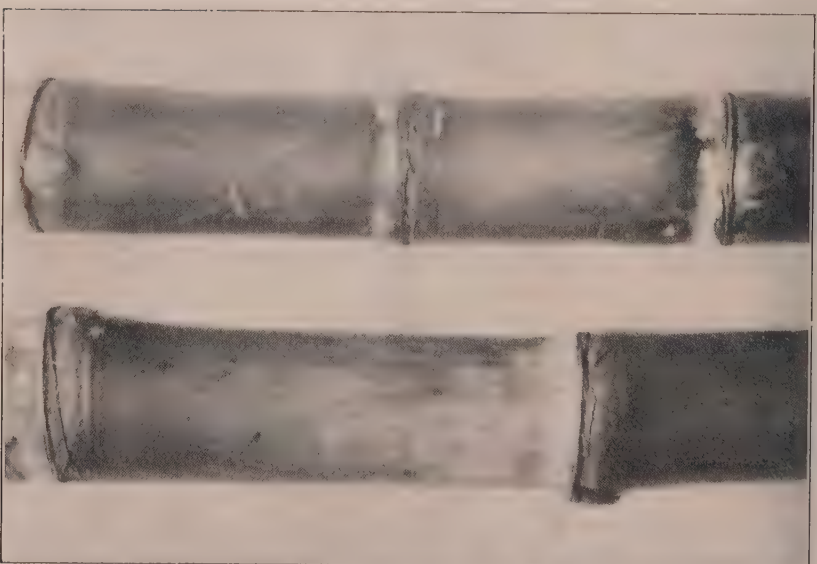
A local name that seems to be rather loosely applied. The canes

\* Earle has further ratified this statement in his “Sugar-Cane Varieties” written for the Tropical Plant Research Foundation (1927) and says: “This is a remarkable cane and promises to be one of our most valuable ones. . . . It is, however most remarkable for its high sugar content, etc.—C. E. CHARDÓN.





CRISTALINA



D 117



so far brought in under this name have proved to be either B-208 or Penang, although the writer saw a beautiful field at Aguirre under this name, which was neither of the above varieties. Mr. Brebner, however, told him that the cane had the disadvantage of becoming pithy very shortly after maturity.

\* **Creole (Criolla).**

The first, and for two hundred and fifty years the only cane planted in Porto Rico. Completely superseded as a commercial cane in the early days of the nineteenth century by Otaheite and since that time only planted for chewing. Now almost extinct, very rarely seen.

Erect, of rather feeble growth, arrows occasionally. Stalks slender, rather short, green with slight flush when fully exposed, scanty bloom. Internodes medium short, straight or slightly staggered cylindrical, furrow shallow but well marked for entire length of internode. Node slightly constricted, somewhat oblique; growth ring narrow, inconspicuous, concolorous; root band narrow, oblique, 5 to 8 mm., rudimentary roots inconspicuous, in about 3 rows; leaf scar glabrous or with a few short scattered cilia, narrow; glaucous band slightly constricted, 8 to 10 mm., conspicuously whitened when young, circle of hairs below bud none. Bud narrowly ovate-triangular, about 8 to 10 mm., exceeding the growth ring, margin narrow, slightly wider below but not shouldered, germination apical, glabrate or nearly so. Leaf sheath glabrous, green faintly glaucous; throat lannate, dark, with medium long hairs towards margins; collar narrow, reaching the midrib, glaucous, sparingly lannate at the margins; ligule widest at center, reaching 4 mm., the ends tapering, nearly even; ligular processes none. Leaf blades erect, the tips declined, somewhat plicate, narrow, 3 to 4½ cm., light green, serrulate with long teeth, the base somewhat ciliate.

Of historical value only and we are so preserving it in the Station collections.

\* **Cristalina.** See Plate XXI, opposite page 169.

(= Light Cheribon. = White Transparent.) Probably introduced as an admixture with Otaheite in the early part of the nineteenth century. Now widely planted on the south coast (it was until Mr. Earle's time the only variety planted at Central Aguirre) and occurring frequently in mixed planting in all parts of the Island until the advent of BII-10/12 and SC-12/4. It was probably second in total acreage in Porto Rico, being surpassed only by the Rayada, which is now disappearing. It is practically the only cane planted in Cuba and it occurs abundantly in many other parts

of the world. It is safe to say that no other variety produces as large a part of the world's sugar supply as the *Cristalina*.

Erect, then declined, vigorous, a good stooler, arrows freely at some times and on some soils, under other conditions it seldom arrows. Stalks medium diameter, green usually with a strong pink flush, bloom heavy. Internodes medium length, cylindrical or somewhat tumid, straight or slightly staggered, furrow evident of medium depth. Nodes oblique, constricted; growth ring yellowish green, conspicuous, elevated, root band narrow, oblique, slightly constricted; rudimentary roots small, inconspicuous, pallid with brownish center, in about 3 rows; leaf scar glabrous, wide in front, appressed behind; glaucous band constricted, rather narrow, not very conspicuous, blending with the bloom of the internode. Buds medium size, triangular-ovate with rounded base, exceeding the growth ring, margin wide, strongly shouldered below; germination apical, base and apex appressed, ciliate. Leaf sheaths glabrous, greenish, quite glaucous, throat densely lannate and with abundant long coarse hairs; collar conspicuous, reaching the midrib, lannate throughout; ligule medium width, margin even; ligular processes usually only one developed. Leaves abundant spreading, flat, medium length and width, about 7 cm., bright green, minutely serrulate, the margins at the base ciliate for two or three inches.

As indicated by long experience, not only in Porto Rico but in all parts of the world, this is one of the best varieties for general planting and one of the very few on which it is safe to base the entire sugar industry of any region. Its continued planting is strongly urged on all those lands where it still continues to give a satisfactory tonnage. It is adapted to a wide range of soil conditions. In maturity it is a mid-season cane, not being at its best under 15 months except late in the season under conditions of drouth when even 11 or 12 months' cane develops a high percentage of sucrose. Even when immature at the beginning of the grinding season it shows a fair percentage of sucrose and purity. Other varieties frequently surpass it in these respects in special instances, but no other variety in general cultivation except B.II. 10(12) surpasses it in average richness at all ages and under all conditions. It usually keeps well in the field after maturity and late plantings or late-cut ratoons may be safely held over for a long crop or *caña quedada*. Unfortunately, this grand kind is beginning to fail on some of the more exhausted and compacted lands. In such situations it is now necessary to either change the prevailing cultural methods or to look for hardier, more resistant varieties. It can be classed as

only medium in its resistance to root disease, vascular bundle fungus, mosaic, and gum disease, being attacked by all of these troubles but suffering less damage from them than some other kinds.

The following selected analyses will show about what may be expected from it at different ages and conditions. Other analyses of *Cristalina* will be found under most of the other older varieties where they are given as a basis for comparison:

Date	Age	Extr.	Brix.	Sucr.	Red Sug.	Purity	Fiber	
12-8-20	10 mo. Rat.	74.1	15.33	12.35	2.29	80.56	8.28	Evidently green 2nd. in
1-5-20	14 mo. Rat.	66.4	19.68	18.10		91.90		sucrose out of 37 kinds..
1-5-21	15 mo. Pla.	66.6	16.96	15.35	0.56	90.36	11.35	
2-4-21	16 mo. Pla.	65.2	18.40	17.27	0.65	83.85	11.83	
11-29-20	20 mo. Pla.	61.5	16.47	14.52	1.20	88.16	12.32	Caña quedada..
4-1918	11 mo. Pla.		22.36	20.0		83.90		Dry weather..
6-1918	18 mo. Pla.		18.68	16.5		88.32		Effect of rain

In tonnage *Cristalina* is often surpassed by such low sucrose canes as *Yellow Caledonia*, B-3412 and *Cavengerie*. No variety, however, responds more rapidly to better cultivation and the heavier application of fertilizers. This is shown by the remarkable yield of an average of 81 tons per acre on a 40-acre field made at Aguirre, crop of 1918. *Cristalina* is a strong ratooner. It is giving good ratoon crops on the south coast, where up to ten years ago ratooning had been practically abandoned. It is chiefly to the strong ratooning power of *Cristalina* that Cuba owes her cheap cane supply. As seen from the above analyses, it may be planted either in fall or spring and on any type of soil that would be considered good cane land.

#### REFERENCES

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- GOSSETT, B. S.—Notes on the Sugar-Cane Experiments in British Guiana. Bull. of the Dept. Agr. of Jamaica, New Series, II, 7, pp. 207-18; 1913.

#### THE CUBAN SEEDLINGS

These seedlings were bred at the Experiment Station at Santiago de las Vegas, mostly by Mr. T. H. Lougher, formerly Plant Breeder at the Porto Rican Insular Station. They date from about 1913. The ones discussed below are the only ones which have given any particular promise in Cuba.

#### C-35 (Super-*Cristalina*).

Seedling of D-74, bred by Mr. T. H. Lougher in the Agricultural

Experiment Station at Santiago de las Vegas, Cuba, in 1914. Sent to Insular Experiment Station of Porto Rico, in July, 1924, by Mr. R. Menéndez Ramos. A fine-looking cane, but, as tonnage experiments have been started only recently with it at the Insular Station, there are no data available as to its probable value here. Drs. Calvino report a yield of 250 tons of cane per hectare from this variety in Cuba, but, inasmuch as this yield was calculated from the harvesting of one single stool, these figures can hardly be taken as indicative of the value of this cane in the "Pearl of the Antilles".

Erect, good vigor, fair stooler. Stalks long, medium to good girth, greenish yellow to yellow, some wax, no bloom. Internodes medium to long, staggered, cylindrical or slightly enlarged on sides opposite bud, slightly appressed at sides laterally to bud; no furrow. Nodes prominent and parallel; growth ring wide, yellowish green; root band rather narrow, rudimentary roots in 2 to 3 rows; leaf scar, glabrate, appressed behind and prominent in front; glaucous band broad, almost even, inconspicuous. Buds small, reaching or sometimes exceeding growth ring; two shapes: one, round, swollen with obtuse or oval apex and the other triangular and pointed; all buds have a distinct margin and minute silvery hairs on apex, sides and base; germination apical. Leaf sheaths with heavy wax covering, subglabrate, tinted with purple within and without; throat and collar narrow and lannated; ligule round at apex, wide at center, 2 or 3 times more than at sides; ligular process none. Leaf blades broad.

#### REFERENCES

- CALVINO, EVA MAMELI Y MARIO.—La "Caña C 35" o sea la "Super-Cristalina". Chaparra Agrícola, I, 9, pp. 1-11. Enero, 1925.  
 ROSENFELD, ARTHUR H.—Informe del Tecnólogo Especial para Cañas. Informe del Comisionado de Agricultura y Trabajo al Honorable Gobernador de Puerto Rico, 1923-24, pp. 143-51.

C-46.

A seedling obtained "probably from foreign seed" by Mr. T. H. Lougher in the Agricultural Experiment Station at Santiago de las Vegas, Cuba, in 1915. Obtained in July, 1925, from Dr. Gonzalo Fortún, Director of that Station. Mr. P. Richardson Kuntz wrote us on 8th June, 1925, that this cane looked very promising indeed on the red lands near San Antonio de los Baños, in the Province of Havana. On 18th July, 1925. Dr. Fortún wrote:

"This is a cane which, in my opinion, is destined to occupy a very important place in our plantings; it matures a couple of months earlier than our Cristalina, stools well and abundantly and its sugar content is good."



The first seed of this variety brought to the Insular Station failed to germinate and more was obtained through Mr. F. S. Earle; hence there has been no time to test it out here.

Erect, good vigor, arrows freely. Stalks long, medium girth, yellowish green with purple flushing, little wax. Internodes medium length, cylindrical but sometimes slightly tumid, not staggered. furrow traces to none. Nodes nearly even; growth ring light yellow and depressed inside opposite bud; root band oblique, broad in front and narrow opposite bud; rudimentary roots 3-5 alternate rows; leaf scar glabrate, appressed behind and prominent in front; glaucous band broad tapering, constricted in front, inconspicuous; buds large, exceeding growth ring by one-third, characteristically pointed, triangular-oval, germination apical, margins very narrow with small and indistinct lobules, sparsely lannated, short apical tufts, light basal plaes. Leaf sheaths subglabrate, with long, scanty, tawny hairs at back, glaucous, tinted within and without; throat and collar broad and sparsely lannated: ligule obtuse, broad at apex, 3-4 mms.

## REFERENCES

CALVINO, EVA MAMELI DE, Y MARIO.—La Caña C. 46. Chaparra Agrícola, I, 2, pp. 22-6. June, 1924.

ROSENFELD, ARTHUR H.—Report of the Special Technologist for Cane. Ann. Rept. of the Insular Expt. Station of P. R., 1924-25.

C-768.

Brought by Commissioner of Agriculture Carlos E. Chardón from the Santiago de las Vegas Experiment Station of the Cuban government. Both he and Mr. P. Richardson Kuntz, Agronomist of the Insular Station of Porto Rico, report it as very promising looking there, it with C-35, C-46 and C.H. 64(21) being about the only promising looking Cuban seedlings. These seeds failed entirely to germinate. On 8th June, 1925, Mr. Richardson wrote from San Antonio de los Baños, in Havana Province, Cuba, that this cane looked very promising on the red lands there, hence more seed was obtained from Dr. Gonzalo Fortún, the Director of the Santiago de las Vegas Station, who reported it as the most vigorous grower of the Cuban seedlings and a good germinater, in July, 1925. Mr. Fortún stated that he has never seen a cane having better general-purpose qualities. This seed, however, arrived in very bad condition and again failed to germinate.

CH-64(21). ("Super-Uba"). See Plate II, opposite page 119; also Plate XX, opposite page 157.

A seedling obtained at the Agricultural Experiment Station, Santiago de las Vegas, Cuba, by Drs. Eva Mameli and Mario Calvino,



through fertilizing Uba cane with the pollen of D-74 in 1921. Brought to the Insular Experiment Station of Porto Rico in 1924. This cane has no appearance of a hybrid, but is typical of the North Indian canes such as Uba, Kavangire, Tekcha, Oshima, etc., as seen from the following description:

Erect, fine vigor and good stooler, arrows freely. Stalks long and slender, yellowish green with reddish purple flush and abundant grayish wax when young, changing to yellow color with reddish brown flush and black wax covering with age. Internodes long, cylindrical, enlarged at base, slightly staggered, furrow traces to none. Nodes parallel and prominent, growth ring broad, even or slightly elevated, yellowish green to concolorous; root band broad and prominent, parallel, light green to concolorous; rudimentary roots large, few and scattered, 3-4 in rows, brownish to concolorous, tendency to sprout forming aerial roots; leaf scar glabrate and appressed; glaucous band broad, inconspicuous, tapering from prominent root band to girth of internodes. Buds ovate, medium size, slightly exceeding growth ring, germination apical, margins narrow, uniform and on upper half only, sparsely lannated with short silvery hairs, very light basal places, tendency to premature germination. Leaf sheaths subglabrate, sides glabrate, yellowish green, inner base slightly tinted with purple, glaucous, closely adherent; throat narrow, very sparsely lannated with minute white hairs, few straggling hairs at margins; collar narrow and reaching midrib, glaucous; ligule narrow at sides, abruptly enlarged and peaked at center, ligular process none. Leaf blades spreading with declining tips, narrow to medium width, dark green, minutely but uniformly serrulated at margins, sparse basal ciliation.

This cane has the same characteristic, so marked in all the North Indian canes, of suckering very late in its growth whenever there is an abundance of moisture. It apparently has one advantage over the *Uba* and Kavangire in that it does not seem to flower so prolifically or so early in the season as do these kinds.

Mr. F. S. Earle, of the Tropical Plant Research Foundation staff in Cuba, wrote us under date of 28th January, 1925:

"In Calvino's plot (Chaparra) on thin black-coco subsoil land . . . *Uba* and its allies (Cayana 10, C.H-64(21)) are not doing as well as *Cristalina*."

Again on the 18th August, 1925, Mr. Earle wrote:

"The supposed hybrid C-64, or C-64(21) as Calvino called it, is outgrowing *Uba*."

On 11th June, 1926, Mr. Earle wrote:

"On the whole, C-64 around Havana, in Havana Province, Cuba, has given slightly better average sucrose in eight series of analyses than Uba and is rather beating it in tonnage, but at the last analysis, May 8, Uba was decidedly ahead in sucrose (17 months).

Variety	Brix	Sucrose	Purity	Remarks
Uba .....	20.84	18.12	85.94	2nd in 20 kinds
C-64.....	20.04	17.65	89.07	3rd in 20 kinds

"Both were ahead of everything else in that field except B.H. 10(12)."

This variety is planted out in tonnage tests at the Station with some ten other varieties of this type and is also included in the 21-variety substation at Bayaney. In both of these plantings it has germinated most excellently and stooled tremendously.

#### REFERENCES

- CALVINO, EVA MAMELI Y MARIO.—La "caña C.H. 64'21," o sea la "Super-Uba". Chaparra Agrícola, I, 7 and 8, pp. 1-12. Nov. and Dec., 1924.
- ROSENFELD, ARTHUR H.—Report of the Special Technologist for Cane. Annl. Rept. of the Ins. Expt. Sta. of Porto Rico, 1924-25.

#### THE DEMERARA SEEDLING CANES

The number of Seedlings introduced from Demerara is very much less than from Barbados. Most of them have made a good record and some are among our most important kinds.

#### D-74.

Seedling of White Transparent (=Cristalina). While listed as a Demerara Cane because it is widely known as such and under that name has acquired a great deal of prominence in Louisiana and Mauritius, this cane is in reality one of the earliest Barbados seedlings! The late lamented Sir John B. Harrison worked conjointly with Mr. John R. Bovell when the first seedlings were produced in Barbados at the same time that Soltvedel, working independently in Java, also rediscovered the fertility of true cane seed. Shortly after the production of these seedlings and before the value of any of them had been yet definitely established—in fact, before they were given permanent numbers—Sir John B. Harrison was transferred to British Guiana as Director of Science of Agriculture, a post which he filled with distinction until his death less than a year ago, and took with him a number of the first Barbados seedlings to work with until he could start producing his now famous Demerara series, of which he is responsible for some 70,000. These Barbados

seedlings were given Demerara numbers, both D-74 and D-95 having been amongst this transferred lot.

D-74 was first imported into Porto Rico by Mr. D. W. May, Agronomist in charge of the Federal Agricultural Experiment Station at Mayaguez, from the Audubon Park Experiment Station in New Orleans, Louisiana, where it was then beginning to give most promising results as a sweet, early-maturing and slightly frost-resistant cane. In 1909 Mr. Sewall reintroduced it, from Antigua this time. It was included in the variety experiment at Aguirre in 1911 and was in cultivation in this Station from 1911 to 1916, when it disappeared, to be reintroduced some six or seven years later.

Earle states that in his experience in Cuba this kind usually gave 3 per cent more sucrose than Cristalina in December, when the crop usually begins. In the Aguirre experiments this kind came out second in tons sugar per acre, producing 66.36 tons cane, with brix, 18.55; sucrose, 15.68; purity, 84.5; tons sugar, 7.53. Station record follows description.

Erect, then recumbent, weak grower and poor stooler. Stalks long and of medium girth, green changing to yellowish-green, heavy bloom, no flush. Internodes of good length, cylindrical, nearly perpendicular, furrow none. Nodes constricted, oblique, growth-ring narrow, 2 to 4 mm., widening on outer margin of curves, even, green to concolorous; root band wide, oblique, green to concolorous; rudimentary roots numerous and scattered, small and inconspicuous, in 4 to 6 rows, purplish to concolorous; leaf scar glabrate, appressed behind; glaucous band medium width, constricted and conspicuous. Buds medium size, 7 by 9 mm., orbicular, never exceeding growth-ring, germination subdorsal, margins very narrow and on upper fourth only, with sparse long hairs, heavy basal plates covering lower three fourths, laminated along fibrovascular bundles of scales. Leaf sheaths with sparse vestiture of short white hairs at back, sides glabrate, no tinting; throat wide, glabrate, covered with black wax, split at sides; collar wide, glaucous, reaching midrib; ligule narrow at sides, becoming slightly wider and peaked at center; short, stubby ligule process on one side only. Leaf blades erect with declining tips, medium width, about 6 cms., dark green, margins minutely and uniformly serrulated to base, some basal ciliation.

Kind	Date	Age	Tons	Brix	Sucr.	Gluc.	Purity
D-74 (1).....	Feb. 1912.....	Plant	..	18.7	16.8	0.8	89.8
D-74.....	Feb. 1915.....	Plant	11.9	17.5	16.39	..	91.2
Cristalina.....	Feb. 1915.....	Plant	22.1	17.98	16.63	..	92.0
D-74.....	May 1916.....	Rat.	10.6	18.4	15.9	..	91.85
Oshette.....	May 1916.....	Rat.	12.2	18.3	17.0	..	92.89

(1) Highest in sucrose and purity out of 25 kinds.

This cane is today suffering severely from Mosaic in Louisiana and seems doomed to extinction there, the place where it has become best known, as it was a failure under Demerara conditions. In Porto Rico since its reintroduction it has not done at all well, showing a consistently weak growth and poor ratooning qualities, while it also has the tendency to flower very early in the season—October to November—and of drying out rapidly thereafter. Planted out in tonnage experiments on good *vega* land at the station in the fall of 1925 along with most of the other Barbados canes in our collection, it has failed utterly to keep up with the majority of these and is about the weakest cane in the lot. It seems to have very little place in Porto Rican cane culture.

## REFERENCES

- CROSS, W. E.—Estudios con Variedades de Cañas Importadas. *Revista Ind. y Agrícola de Tucumán*. XII, p. 85; 1921.  
WATTS, FRANCIS.—Sugar-Cane Experiments in the Leeward Islands, 1918–19, p. 8. Issued by the Comm. of Agriculture for the West Indies.

## D-95.

Another Barbados early seedling, like D-74. *q. v.* Imported from Audubon Park, Louisiana, in 1904 by Mr. May of the Mayagüez Station. Mr. Sewall notes having received seed from Mayagüez. In the crop of 1910 it stood highest in his tests in both brix, sucrose and purity as follows: brix, 18.4; sucrose, 17.8; purity, 36.70. It was cultivated at Guánica in 1910 and 1911, where Mr. Murphey notes that it was troubled by leaf spot. It was included in the variety plots at Aguirre in 1911, where it stood first in tons sugar per acre. Its record follows: tons cane, 68.31; brix, 18.45; sucrose, 15.78; purity, 83.7; tons sugar, 7.84. It does not seem to have been cultivated at this Station. Not seen in Porto Rico.

The remarks made under D-74 may be repeated here. This is another early-maturing kind that after making an exceptionally good record here has been completely abandoned and lost—a fact that is hard to understand, although, judging by its behavior in Louisiana, where it was always inferior to D-74 in general hardiness, with the exception of one or two of the lower river parishes, it could never have competed with such canes as B.H. 10(12) or S.C. 12/4 here.

## REFERENCES

- BROGGI, CESAR.—Memoria de la Estación Experimental de Azúcar, 1909; Lima, July, 1910.



STUBBS, W. C.—Sugar Cane, Field Experiments, Varieties of Cane.  
La. Agr. Expt. Station, Bull. 26, 2nd Ser., Feb., 1894.

D-108.

Received in December, 1924, through the courtesy of Sir John B. Harrison, Director of Science and Agriculture in British Guiana. No data as yet available for Porto Rico.

Recurrent, fair vigor, good stooler. Stalks long, medium girth, green to yellow. Internodes medium length, cylindrical, not staggered, no furrow. Nodes nearly even, parallel; growth ring narrow, 2-4 mms., slightly elevated, concolorous; root band narrow, parallel, concolorous; rudimentary roots conspicuous, few and scattered, 3-4 in rows, brown; leaf scar glabrate and appressed behind; glaucous band narrow, slightly constricted and conspicuous. Buds small, 5-7 mms., not exceeding growth ring, plump, orbicular, germination subdorsal, margins narrow, lannated and on upper half only, shouldering abruptly at sides, no apical tufts nor basal plac. Leaf sheaths lannated with long tawny hairs at back, sides glabrate, tinted within and without, glaucous; throat narrow and heavily lannated with long, coarse hairs; collar medium width, reaching midrib, lannated; ligule narrow, concave above at center and convex below, no ligular process. Leaf blades spreading with declining tips, medium width about 6 cms., dark green, margins minutely serrulated abundant basal ciliation.

\* D-109.

Introduced from Antigua by Mr. Sewall in 1909. It was probably also included in the direct importation from Demerara made by Central Canóvanas, though this was not so understood by Mr. Sewall. It is planted extensively in Eastern Porto Rico, especially in the districts about Canóvanas, Río Piedras, Fajardo and Naguabo. Since the outbreak of mosaic in the western part of the Island, seed cane from this eastern region has been in strong demand and this variety has been widely disseminated. It is now probably planted more largely than any other of the Demerara seedling canes. It was first noted in the Guánica reports in 1913. In 1915 there were 9 acres of it there but it has attracted no attention in that district. It has been in continuous cultivation at this Station since 1911 and seed of it has been sent to many planters.

Usually soon decumbent, good vigor and stooling, arrows, freely. Stalks long, medium diameter, red or reddish purple, heavy bloom. Internodes medium to long, somewhat barrel-shaped, or sometimes subcylindrical and enlarged below, furrow shallow, often wanting. Nodes strongly constricted; growth ring broad, usually 4 to 6 mm.,



even or nearly so, at first yellowish then dark purple or brownish purple; root band narrow, 6 to 7 mm., strongly constricted, at first yellowish but at length darker than the internode; rudimentary roots small, crowded, in about 3 rows; leaf scar glabrous, appressed behind; glaucous band narrow, 6 to 7 mm., constricted. Buds small, oval-ovate, obtuse, 8 to 9  $\times$  8 to 9 mm., exceeding the root band but seldom exceeding the growth ring, margin very narrow, germination apical, inconspicuous basal plates and scanty marginal and apical vestiture, sometimes sub-glabrate. Leaf sheaths with a short scanty vestiture which is usually deciduous, leaving the mature sheath glabrate, strongly tinted, glaucous; throat lannate with a scanty vestiture of longer hairs on the margins; collar well marked, reaching the midrib, often with purplish tints, glaucous or the margins sparingly lannate; ligule short, 2 to 3 mm., nearly even; ligular processes irregular or wanting, sometimes one well developed. Leaf blades spreading, flat, about 6 cm., rather dark green, the midrib sometimes purplish with age, minutely serrulate, the base even and sparingly ciliate.

This is a good general-purpose cane well adapted for general planting. It closely resembles Rayada and Cristalina in cultural characters and requirements, but seems a little better able to withstand unfavorable soil conditions. It seems to be especially well adapted to the red shale hills. It ripens a little later than Cristalina, but develops equally good sucrose at maturity. It may be planted either in fall or spring, but on account of its free arrowing should not be held over as *caña quedada*.

It seems to be a little more resistant to root disease than Cristalina, but it is perhaps even more susceptible to mosaic, once it takes it, being resistant but not tolerant. Recent observations in the Trujillo Alto district indicate that it is strongly resistant or perhaps immune to gum diseases. If this proves to be true it will add greatly to its value. It suffers severely from *Helminthosporium sacchari* leaf spot and the bundle fungus, *Plasmidiophora*.

Its record as sugar producer is only moderately good at Fajardo, averaging about 2½ tons per acre. It was largely planted there, especially in hill lands. Our highest record comes from Central Lafayette on the south coast, first in sucrose as plant cane and second as ratoons out of 7 kinds tested as follows:

Kind	Date	Age	Brix.	Sucr.	Purity
D-109 .....	April 1914 .....	Plant.....	21.8	20.3	93.5
D-109 .....	February 1915 .....	2nd. Rat....	21.7	19.5	89.8

As reported in Circular 8, it stood: plant cane, 36 to 56 tons; total for 3 crops, 78.72 tons; brix, 18.42; sucrose, 14.98; purity, 87.0. This would indicate an average yield of 2.89 tons sugar per acre for each of the three crops. Other analyses follow:

Kind	Date	Age	Arr.	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
D-109	12-10-20	Rat. 10 mo.	No	78.8	14.28	9.98	8.22	69.78	8.54
Rayada	12-10-20	Rat. 10 mo.	No	71.1	15.83	13.45	1.76	84.96	8.08
D-109	12-30-20	Rat. 9 mo.	No	70.0	18.94	16.38	0.91	86.58	10.80
D-109	12-30-20	Rat. 9 mo.	Yes	67.3	20.04	17.85	1.15	89.70	13.08
D-109	12-24-20	Pla. 14 mo.	Yes	61.1	19.58	17.46	0.67	89.17	14.0
Cristalina	12-24-20	Pla. 14 mo.	No	65.7	18.88	17.08	0.52	90.65	13.72
D-109	2-4-21	Pla. 16 mo.	No	65.2	18.0	16.33	0.69	90.72	11.18
D-109	2-4-21	Pla. 16 mo.	Yes	64.0	17.5	16.34	0.62	87.65	12.24
Cristalina	2-4-21	Pla. 16 mo.	Yes	65.2	18.40	17.27	0.65	93.85	11.03
D-109	4-1-22	Pla. 12 mo.	Yes	69.2	19.51	17.28	1.18	88.56	Station
Cristalina	4-1-22	Pla. 12 mo.	No	63.6	18.61	17.22	0.70	92.50	Station
D-109	5-7-23	Rat. 12 mo.	Yes	65.0	19.90	18.37	0.72	92.31	Station
Cristalina	5-7-23	Rat. 12 mo.	No	55.6	20.80	19.92	0.54	95.77	Station
D-109	1-20-23	Pla. 13 mo.	No	.....	19.60	16.66	.....	85.00	Aguirre
D-109	1-20-23	Pla. 14 mo.	No	.....	19.50	16.31	.....	83.70	Aguirre
D-109	2-20-23	Pla. 15 mo.	No	.....	18.40	14.41	.....	78.40	Aguirre
D-109	12-2-24	Pla. 16 mo.	No	.....	15.10	12.13	.....	80.80	Aguirre
D-109	12-18-24	Pla. 16 mo.	No	.....	16.20	13.29	.....	82.00	Aguirre
D-109	5-16-23	Pla. 14 mo.	No	.....	.....	16.12	.....	86.24	Hatillo
Cristalina	5-16-23	Pla. 14 mo.	No	.....	.....	19.27	.....	94.36	Hatillo

In the last experiment at Hatillo Fruit Farm, corresponding to the last set of figures above, D-109 produced 25.7 tons of cane and 3 tons of sugar per acre, against 16 and 2.33 tons respectively for Cristalina on those red shaly hills. Earle considers this variety of doubtful value for the South Coast.

## REFERENCES

- ANDINO, A. M. DE—Cane Varieties in Northern Porto Rico. Memoirs of the Association of Cane Technologists of P. R., I, 1, pp. 1-4; June, 1922.
- COOK, MEL. T.—Helminthosporium Leaf Spot of Sugar Cane in Porto Rico. Jour. of the Dept. of Agr. of P. R., VIII, 4, pp. 5-10; Oct., 1924.

## D-116.

Seedling of White Transparent.

Introduced by Central Canóvanas. As planted in Porto Rico this was the same as D-625, which see. There was some doubt as to which of these kinds is really represented here, but the identity of the two have now been thoroughly established by the introduction of the two from pure cultures in Demerara in December, 1924. As a matter of fact, the true D-116 does not resemble D-625 in the least, being much more similar in general appearance to D-117. In a letter received from Sir John B. Harrison, under date of 26th

September, 1923, he had the following to say in regard to this variety:

"D-116 when raised with us, and it is still under cultivation in our experimental fields, very clearly resembles D-117, differing from it only in colour. Both of these canes were produced by us from one arrow of a White Transparent cane of a strain obtained from St. Kitts and then termed Caledonia Queen. The colour of D-116 may be described as a dark green, with usually a patched dirty-looking soiled surface changing through soiled olive-green and light-green to a yellowish-green when mature. Where exposed to the sun the cane has a horn-yellow tinge and is blotched with large brownish red splotches. There is an irregular distribution of 'bloom' over some of the internodes, the distribution varying greatly, some internodes being nearly covered with 'bloom' whilst others show very little. On stripping the adherent leaf sheaths from the upper joints some are seen to be faintly striped, a characteristic of the majority of canes of White Transparent parentage, while others are of uniformly light-green colour. The lowest internodes of the cane, dark green in colour, are short and cylindrical. The higher internodes become longer with growth until somewhat over the medium length. In some cases the joints are straight and in others somewhat staggered but always tend to become markedly constricted as the cane matures; while the canes generally tend to rapidly taper off in diameter with increasing length. In our trials we found it very difficult indeed to distinguish between D-116 and D-117, the latter however, as a rule gave juice of somewhat higher saccharine content and purity than did the former. Over several crops on large-scale trials their yields of cane and of sugar were practically identical, the differences as a rule being well within the range of probable error. It is now, however, many years since we ceased to cultivate D-116 on a large scale plot. The planters here did not care for either D-116 or D-117, as these canes when grown on our heavy soils tended to be very fibrous, while their yields rapidly decreased when cultivated as ratoons. . . . Even in Demerara there was confusion on one plantation between the varieties numbered D-116 and D-625, but when I examined specimens of the cane growing there those termed 116 were typical 625."

Erect, at length recumbent, good vigor, fine stooler. Stalks long, medium girth, green changing to yellow like D-117 on exposure to sun, some bloom and flush. Internodes long, cylindrical, slightly enlarged at base, slightly staggered; furrow traces to none. Nodes slightly enlarged, oblique; growth ring medium width, 3-5 mms., elevated, concolorous; root band wide, oblique and concolorous; rudimentary roots abundant, large and rather crowded, in rows 3-5, brownish; leaf scar glabrate and appressed behind; glaucous band broad, slightly constricted, inconspicuous. Buds medium size, 7-9 mms., plump, triangular ovate, not exceeding growth ring, germination apical, margins narrow and on upper half only, lannated, very short apical tuft, light basal plaes. Leaf sheaths subglabrate, slightly

tinted inside and out, glaucous; throat indistinct, broad, lannated with coarse hairs; collar narrow, dark reaching midrib, glaucous; ligule narrow except at center, concave below, nearly even above, ligular process 2-3 cms., long on one side only, lanceolate. Leaf blades spreading with declining tips, medium width, about 6 cms., dark green, minutely and uniformly serrulated except at base, very sparse basal ciliation.

## REFERENCES

- EARLE, F. S.—Note on this variety and D-625 in the International Sugar Journal for Aug., 1923, p. 432.  
WATTS, FRANCIS.—Sugar-Cane Experiments in the Leeward Islands, 1919-20.—Imperial Dept. of Agr. for the West Indies.

\*D-117. See Plate XXI, opposite page 169.

Imported from Audubon Park, Louisiana, in 1904 by Mr. May of the Mayagüez Station. It was mentioned in the Guánica reports for 1910 as among the best canes for that district and was until 1922 more widely planted there than any other kind. It was included in the variety test at Aguirre in 1911. Fajardo reports for 1913 mention it among the three best canes for that district, but at present it is hardly planted there. It has been sent out from here very widely. It is probably more widely planted in Porto Rico than any other Demerara seedling except D-109.

Strictly erect, good vigor and stooling, arrows freely and early. Stalks long, medium diameter, green then yellowish, flush none or very slight, little or no bloom. Internodes medium to long, straight or somewhat staggered, cylindrical or sometimes larger below, furrow slight or none. Nodes scarcely constricted, somewhat oblique; growth ring narrow, brownish, prominent, the widest part of the stalk; root band oblique, 8 to 10 mm., light green, tapering downward; rudimentary roots crowded in about 4 rows, leaf scar glabrous, appressed behind; glaucous band slightly constricted, about 8 mm., conspicuous. Buds large, ovate, obtuse about  $14 \times 14$  mm., exceeding the growth ring by one-fourth, margin narrow, uniform, germination apical or subapical, often developing, with short basal scales and scanty short vestiture. Leaf sheaths with scanty short appressed vestiture often becoming nearly glabrate, green somewhat glaucous; stained with purple at base within; throat densely lannate and with a conspicuous vestiture of long hairs on the margins and behind the ligule; collar conspicuous, dark brown, reaching the midrib, lannate on the margins; ligule short, 2 to 3 mm., nearly even; ligular processes



unequal, one usually strongly developed often 2 cm. long, acute, the other usually wanting. Leaf blades suberect, crowded, flat, somewhat two-ranked, dark green, 6 to 7 cm., wide, very minutely serrulate, the base even, not ciliate.

This is one of the best of these canes for general planting in Porto Rico. It thrives on a great variety of soils. On the low compacted *vegas* it will give a tonnage almost or quite equal to Yellow Caledonia. In the red shale hills it will decidedly exceed that kind. It is, however, late in maturing and should always be planted in the fall as *gran cultura*. It arrows too freely to be held over as *caña quedada*, on long crop.

It is decidedly more resistant to both root disease and mosaic than Cristalina and Rayada and it is usually a good ratooner. Its resistance to gum disease is not fully determined but it seems to be good. At least no diseased canes of this kind have been found, although it occurs in mixed plantings where the Otaheite is heavily infected by gumming.

Early in the season it is poor in sucrose, especially in the stalks that have not arrowed. When fully mature it develops about the same per cent of sucrose as Cristalina. It should never be planted in mixed plantings where it is likely to be cut too green. Its record at Aguirre in 1911 was as follows: tons cane, 69.821; brix, 17.09; sucrose, 13.52; purity, 79.01; tons sugar, 6.59. It was third in tonnage among the kinds tested, but these plots were cut in January and this cane was evidently still too green to have developed its best sucrose. Mr. Sewall reports that in 1910 this cane stood second in sucrose and purity by mill test at Naguabo. Its record was: brix, 16.7; sucrose, 15.70; purity, 94.0. The Fajardo reports were usually low, seldom averaging more than 3 tons sugar per acre. At Central Lafayette, April 1914, as plant cane it gave: brix, 21.1; sucrose, 18.6; purity, 88.1. As second ratoon in February 1916, it gave: brix, 20.4; sucrose, 18.0; purity, 88.2. In Guánica, December 1920; a field of 12.85 acres of *gran cultura* gave, tons cane, 49.715; brix, 15.27; sucrose, 13.24; purity, 84.22; tons sugar, 5.23. Here again the cane was evidently too green. At this Station, as reported in Circular 8, it stood second in tons cane as plant cane, but fell to sixth place in total tons from three crops. The record follows: tons cane as plant, 57.23; total for 3 crops, 99.55; brix, 17.50; sucrose, 15.92; purity, 90.9. Cristalina record in these tests was tons plant cane, 43.87; total for 3 crops, 77.52; brix, 16.60; sucrose, 15.02; purity, 90.5. This would figure an average of 3,972 tons



sugar for each of the three crops for D-117 and 2.91 tons for Cristalina. Some more recent analyses are:

Kind	Date	Age	Arr.	Extr.	Brix.	Sucr.	R. S.	Puri.	Fiber
D-117	12-30-20	Rat. 9 mo.	No	69.13	15.13	12.15	1.69	80.30	11.58
D-117	12-30-20	Rat. 9 mo.	Yes	67.2	16.53	13.66	1.71	82.52	11.80
D-117	12-20-20	Rat. 14 mo.	No	67.6	16.30	13.78	0.72	84.54	10.36
D-117	12-20-20	Rat. 14 mo.	Yes	68.7	17.20	15.03	0.21	87.38	10.60
Cristalina	12-20-20	Rat. 14 mo.	No	70.0	17.50	15.53	0.28	88.74	9.60
D-117	1-26-21	Rat. 15 mo.	No	67.5	15.55	12.94	1.17	83.21	10.40
D-117	1-26-21	Rat. 15 mo.	Yes	67.0	18.30	15.82	0.76	86.44	11.00
Cristalina	1-26-21	Rat. 15 mo.	No	70.3	17.85	16.14	0.38	90.42	11.22
D-117	2-4-21	Pl. 16 mo.	No	64.7	17.20	14.71	1.50	85.52	12.60
D-117	2-4-21	Pl. 11 mo.	Yes	61.5	17.50	15.20	1.13	86.85	12.32
Cristalina	2-4-21	Pl. 16 mo.	Yes	65.2	18.40	17.27	0.65	93.85	11.83
D-117	4-6-21	Pl. 18 mo.	Yes	68.0	19.45	18.02	0.255	93.48	10.47
D-117	4-3-22	Pl. 12 mo.	Yes	66.7	19.51	16.37	1.57	83.90	Station
Cristalina	4-3-22	Pl. 12 mo.	No	63.6	18.61	17.22	0.70	92.50	Station
D-117	5-3-23	Rat. 12 mo.	Yes	.....	20.55	19.92	0.48	94.01	Station
Cristalina	5-3-23	Rat. 12 mo.	No	.....	20.80	19.92	0.54	95.77	Station
D-117	1-24-23	Pl. 13 mo.	No	.....	19.90	16.76	.....	84.20	Aguirre
D-117	2-23-23	Pl. 14 mo.	No	.....	19.70	15.70	.....	79.70	Aguirre
D-117	3-22-23	Pl. 15 mo.	No	.....	19.06	15.52	.....	81.70	Aguirre
D-117	4-21-23	Pl. 16 mo.	No	.....	18.10	15.89	.....	85.00	Aguirre
				Tons cane per acre			Tons sugar per acre		
D-117	3-29-24	Pl. 22 mo.	Yes	50.40	.....	16.02	5.83	86.90	Hatillo
Rayada	3-29-24	Pl. 22 mo.	No	6.56	.....	15.67	0.80	88.20	Hatillo
D-117	4-11-23	Rat. 15 mo.	Yes	.....	21.00	19.37	.....	92.23	Station
BH10(12)	4-11-23	Rat. 15 mo.	No	.....	24.25	23.20	.....	96.26	Station
D-117	6-7-24	Pl. 11 mo.	Yes	.....	18.60	15.80	.....	84.24	Hatillo
BH10(12)	6-7-24	Pl. 11 mo.	No	.....	19.20	16.82	.....	87.60	Hatillo
D-117	11-7-24	Pl. 11 mo.	Yes	.....	13.50	77.64	.....	57.34	Station
D-117	12-8-24	Pl. 12 mo.	Yes	.....	15.20	11.91	.....	78.36	Station
D-117	1-9-25	Pl. 13 mo.	Yes	.....	16.05	13.06	.....	81.37	Station
D-117	1-9-25	Pl. 17 mo.	No	26.79	17.86	15.63	.....	87.50	Aguirre
D-117	2-9-26	Pl. 16 mo.	Yes	40.50	14.98	12.70	3.76	85.50	Station
BH10(12)	2-9-26	Pl. 16 mo.	No	54.81	17.43	15.50	6.05	86.06	Station
D-117	5-27-26	Rat. 12 mo.	No	20.68	21.05	17.84	.....	84.87	Station
H-109	5-27-26	Rat. 12 mo.	No	25.00	18.95	16.70	.....	88.10	Station

## REFERENCES

- BARROW, E. H.—Cane Varieties at Guánica. Mem. Assn. Sug. Tech. of P. R. I, 1, pp. 5-6; June, 1922.  
 MATZ, JULIUS.—The Gumming Disease of Sugar Cane. *Ibid*, pp. 18-21.

## \* D-147.

This kind is present in the experimental plots at Fajardo. Seed was brought to this Station in November, 1919. But failed to germinate. Not seen elsewhere. We find no record of its introduction. Earle obtained a little seed from Fajardo in 1920 and obtained one stool, which proved to be typical Yellow Caledonia. A row of this variety was planted at the Insular Station for study and comparison in November, 1924, and turned out to be only Yellow Caledonia, hence its cultivation here as D-147 has been finally abandoned.

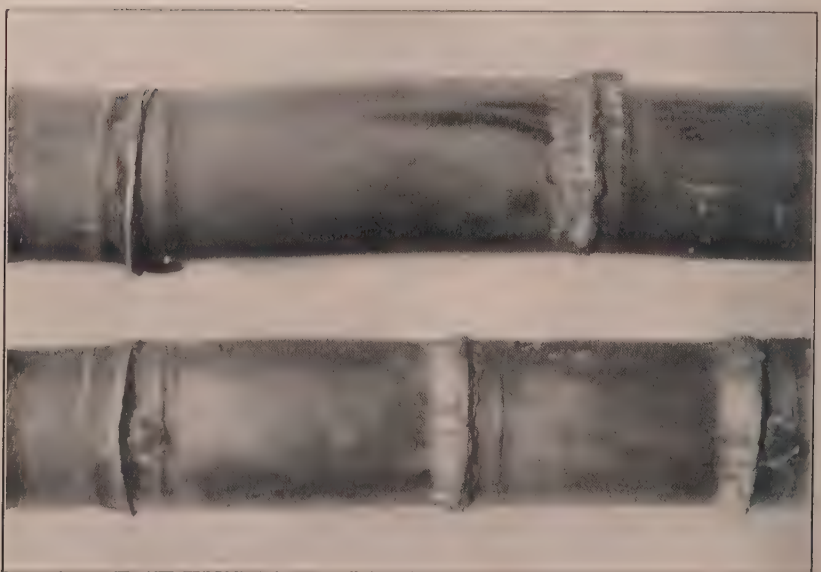
## D-216.

When the writer arrived at the Insular Experiment Station in





D 357



D 625

1923, this cane was growing well and being distributed under this number, but a close study by the writer and Mr. Luis Serrano has shown that this is just another case of mixed numbers, as the cane is identical in every respect D-448, which see.

**D-247.**

Obtained, on recommendation of Mr. P. Richardson Kuntz, Agronomist of the Insular Experiment Station of Porto Rico, from Dr. Gonzalo Fortún, Director of the Cuban Experiment Station at Santiago de las Vegas, in July, 1925. It arrived in bad condition and failed to germinate; hence Dr. Fortún was requested to make us another small sending, but the seed again came wrapped only in newspaper and arrived in such a dried out condition that no germination could be secured. Dr. Fortún wrote the author in regard to this variety on 18th July, 1925:

"The D-247 was recommended to you undoubtedly on account of the facts I am now going to relate: Along about 1911 or 1912 we sent to the Quinta de los Molinos, where our agricultural school is located, some 60 varieties of cane. Some years later, probably about 1919, I discovered mosaic in this field, although nothing was done to destroy the diseased varieties, hence all the varieties there suffered from the attacks of the disease according to their resistance to same. Last May I visited this field in order to obtain some varieties which had been sent from the Experiment Station and had since been lost from our collection; many had been completely destroyed by mosaic, others were very heavily infected, and one was noticeably, on account of its vigor and remarkable development. I was able to determine this outstanding one as D-247. In spite of the fact that its leaves showed all the characteristic markings of the disease, its development had not been impeded, which fact forces me to the provisional conclusion that, in spite of being susceptible to mosaic, this disease does not affect its development materially."

**D-355.**

Noted by Cowgill as occurring at Dolores, Río Grande, July 15, 1912. No other record of this cane.

Not seen.

\***D-357.** See Plate XXII, opposite page 185.

This cane figured in Cowgill's notes as occurring at Fajardo in 1913. We have no record of its introduction. Seed was brought from Fajardo to this Station in November, 1919. It was included in the Santa Rita immunity experiment where it suffered considerably from root disease and top rot and was severely attacked by mosaic. It seems to have no special value.

Erect, good vigor, poor stooler. Stalks long and of good girth, yellowish-green basal color, heavily overlain with red, changing to purple, heavy bloom. Internodes medium to long, appressed at sides and noticeably enlarged at base, slightly staggered, no furrow.

Nodes constricted and oblique; growth-ring wide, 4 to 6 mm., greenish to concolorous, elevated; root-band narrow, yellowish-green to concolorous, overlaid with wax covering; rudimentary roots small, numerous, crowded and inconspicuous, in rows 4 to 5, purplish to concolorous; leaf scar glabrate, broad and prominent in front and appressed behind; glaucous band narrow, constricted, inconspicuous. Buds medium to large, 7 by 9 mm., orbicular, reaching growth-ring, germination sub-apical, margins narrow, on upper half only, abruptly shouldered at sides, lannated, very short, but broad, apical tuft, heavy basal plates, heavy lannation along fibro-vascular bundles. Leaf sheaths sub-glabrate at back, sides glabrate, heavily tinted without and slightly within, somewhat glaucous; throat wide, dark gray, lannated with short appressed hairs, some straggling coarse hairs at sides; collar broad, dark colored, reaching midrib, lannated with tiny velvety hairs, reaching midrib; ligule narrow, 2 to 4 mm., nearly even, no ligular process. Leaf blades spreading, broad, 8 to 10 cms., not flat, dark green, margins minutely serrulated except at base, scanty basal ciliation.

This is a fine-looking and very sweet cane, but it is a very poor stooler, the only way to get results with it being to plant very thickly, as Mr. W. C. Dreier does at the Hatillo Fruit Farm. It made a bad failure in Earle's trials at Aguirre during 1921-23, but at the Hatillo Fruit Farm, handled as indicated above, on poor shaly red clay hill-sides, it has the following record from cane ground at Central Victoria on 16th May, 1923:

Variety	Tns. cane per acre	Purity	Sucrose	Yield factor	Tns. sugar per acre	Age
D-857.....	21.70	90.02	19.04	14.09	3.06	Pl. 14 months
Cristalina.....	16.00	94.36	19.27	14.59	2.33	Pl. 14 months
D-357.....	32.04	89.50	16.61	12.16	3.89	Rat. 10 months
D-357.....	26.87	(Average over two years)			3.47	.....

## REFERENCES

- EARLE, F. S.—The Resistance of Cane Varieties to the Yellow Stripe or Mosaic Disease. P. R. Ins. Expt. Sta., Bull. 19; 1919.  
 VEVE, RAFAEL A.—Our Experience with Cane Varieties. Mem. Assn. Sugar Technologists of Porto Rico, I, 1, pp. 28-31; June, 1922.

## D-419.

Received in December, 1924, through the courtesy of Sir John B. Harrison, Director of Science and Agriculture in British Guiana and the originator of this variety. No data as yet available as to the conduct of this cane in Porto Rico.

Erect, at length recumbent, good vigor, fine stooler. Stalks long,



medium girth, green to yellow, abundant bloom. Internodes long, cylindrical, slightly enlarged at base, appressed laterally to bud, slightly staggered, furrow broad and shallow. Nodes nearly even, oblique; growth ring medium width, 3-5 mus., slightly elevated, concolorous; root band oblique, concolorous; rudimentary roots few, large, scattered, 3-4 in rows, green changing to purple; leaf scar glabrate and appressed behind; glaucous band broad, constricted and inconspicuous. Buds medium to large, 8-10 mms., triangular ovate, exceeding growth ring by one-third, germination apical, margins broad, flat, uniform, shouldering at base, glabrate, short and scanty apical tufts, light basal plaes. Leaf sheaths with abundant dorsal vestiture of short, tawny, deciduous hairs, sides glabrate; slightly tinted inside and out, glaucous; throat broad, dark and well defined, covered with short appressed hairs, straggling hairs at margins, tendency to split; collar wide and well defined, reaching midrib, lannate; ligule narrow, nearly even, no ligular process. Leaf blades spreading with declining tips, broad, 7-9 cms., dark green, minutely serrulated at margins, some basal ciliation.

\* D-433. See Plate II, opposite page 119.

We have no record of the introduction of this cane. In Mr. Crawley's notes under date of June 24, 1913, it is mentioned in a list of the best canes for the Fajardo district given by Mr. McConnie. It is now being planted at Fajardo more largely than any other variety and it is giving heavy average tonnage and sugar per acre. Seed was brought from Fajardo to this Station in 1918. It is doing well here, but apparently no better than D-117. It has been seen elsewhere in the Santa Rita immunity experiment, where seed was sent from Fajardo, at Central Carmen, where it was a failure, at Hatillo Fruit Farm and at Centrals Mercedita de Yabucoa and Aguirre.

Erect or at length declined, good vigor and stooling, seldom arrows. Stalks long, medium stout, green with a slight pink flush completely covered by a dense gray bloom. Internodes long, cylindrical or somewhat enlarged below, staggered, furrow none. Nodes constricted, oblique; growth ring narrow, even or a little sunken, greenish; root band about 8 mm., concolorous; rudimentary roots large but indistinct, in about 3 rows; leaf scar glabrous, appressed behind; glaucous band almost completely obscured by heavy bloom of the internode. Buds broadly ovate, obtuse, about 12 to 14 × 12 to 14 mm., exceeding the growth ring by one-fourth, margin medium width, uniform, germination subdorsal, basal plaes short, marginal vestiture heavy, ending in a pronounced apical tuft and ex-

tending down the back of the bud to the germination point. Leaf sheaths with a moderate vestiture of long, stiff, assurgent hairs, greenish, densely glaucous; throat lannate and with a sparse vestiture of long hairs on the margins and behind the ligule; collar narrow, reaching the midrib, pallid, glaucous, slightly lannate on the margins; ligule about 3 mm., margin fimbriate-ciliate; ligular processes none. Leaf blades erect, the tips declined, broad, flat or the margins slightly revolute, reaching 8 cm. or more, dull blue-green, serrulate to the sparingly ciliate base.

This cane seems to be particularly adapted to the low, compact maritime *vegas* and the yellow clay alluviums on the northeast coast, where Rayada and Cristalina have failed so badly. It grows fairly well on the red shale hills, but seems to have no advantage there over a number of other canes. It could be used to advantage wherever Yellow Caledonia is being planted, for it will yield equal tonnage and give better sucrose. It is best planted in the fall as *gran cultura*, though it can be used for spring planting. It arrows so little that it would probably stand over well for long crop or *caña quedada*, but this has not been tested.

It was included in the Santa Rita immunity tests but the results were not conclusive. It seemed, however, to have good resistance to mosaic and it certainly resists root disease and ratoons well, especially on low compact lands.

At Fajardo it has given the following average results in tons of sugar per acre. In 1915, 3.73 tons; 1916, 3.47 tons; 1917, 3.44 tons, and in 1919, 3.75 tons. More recent analyses here as follows:

Kind	Date	Age	Extr.	Brix.	Sucr.	R. S.	Puri.	Fiber
D-433	11-29-20	Rat. 13 mo.	67.9	16.67	12.56	2.48	75.66	10.18
Ave. of 5 Cheribon	11-29-20	Rat. 13 mo.	.....	.....	13.68	1.67	87.88	12.29
D-433	1-10-21	Rat. 14 mo.	65.9	15.10	13.03	1.81	86.29	10.91
Cristalina	1-10-21	Rat. 14 mo.	71.4	17.30	15.84	0.64	86.67	12.01
D-433	2-23-21	Rat. 16 mo.	72.2	18.90	15.46	1.49	86.36	11.12
Cristalina	2-23-21	Rat. 16 mo.	71.4	18.90	17.40	0.30	92.06	12.58
D-433	4-6-21	Pl. 18 mo.	67.1	19.60	18.18	0.53	92.24	11.84
D-433	1-20-23	Pl. 13 mo.	.....	20.00	16.62	.....	83.10	Aguirre
D-433	2-20-23	Pl. 14 mo.	.....	20.50	16.59	.....	80.90	Aguirre
D-433	3-19-23	Pl. 15 mo.	.....	20.50	17.11	.....	82.60	Aguirre
D-433	4-18-23	Pl. 16 mo.	.....	19.10	16.19	.....	84.80	Aguirre
D-433	2-9-26	Pl. 16 mo.	.....	18.95	11.10	.....	79.60	Station
BH-10(12)	2-9-26	Pl. 16 mo.	.....	17.43	15.00	.....	89.06	Station

In the tonnage experiment at the Station, in comparison with BH-10(12) and fourteen others of our best canes, D-433 stood sixth in production of cane per acre, but only thirteenth in sucrose and

eighth in production of sugar per acre, producing 52.22 tons of cane and 4 tons of sugar per acre, in comparison with 54.81 and 6.05, respectively, for the BII 10(13), which stood fourth in tonnage of cane per acre, fourth in sucrose content and second in production of sugar per acre. Earle considers that this variety did not come up to expectations in Aguirre. The following letter from Mr. F. Colón Moret, Chief of the Agronomical Laboratory at Central Mercedita de Yabucoa, gives the results synthetically as obtained at that Central during the crop of 1923 with this variety:

CENTRAL MERCEDITA  
THE YABUCOA SUGAR COMPANY  
YABUCOA, PORTO RICO

JULIO 17, 1924.

SR. ARTHUR H. ROSENFELD,  
*Tecnólogo Especial,*  
Estación Experimental Insular,  
Río Piedras, Porto Rico.

MUY SR. N. Y AMIGO:

Tenemos el gusto de informarle a continuación los resultados obtenidos por nosotros durante el pasado cosecho, con la caña D-433:

COLONIA "INGENIO"	
Caña .....	D-433
Cuerdas .....	28.33
Toneladas de caña .....	1,189.91
Toneladas de caña por cuerda.....	42
Siembra de Gran Cultura	
Análisis del jugo normal:	
Brix .....	16.32%
Sucrosa.....	12.78%
Pureza .....	78.30%
Rendimiento en azúcar 96°.....	9.124%
Tons. de azúcar 96° por cuerda.....	3.832

COLONIA "ISLETA"

De esta colonia molimos cañas de gran cultura y de retoños, pero debido a que no hemos podido determinar cuáles análisis corresponden a las cañas de gran cultura y cuáles a las de retoños, hemos aplicado el promedio de los análisis al total de la caña molida obteniendo los siguientes resultados:

Caña .....	D-433
Cuerdas .....	100.75
Toneladas de caña .....	3,203.12
Toneladas de caña por cuerda.....	31.79
Siembra de gran cultura	
Análisis del jugo normal:	
Brix .....	16.38%
Sucrosa.....	12.65%

Pureza -----	77.23%
Rendimiento en azúcar 96° -----	8.948%
Tonladas azúcar por cuerda (96°) -----	2.845%

Tendremos mucho gusto en suministrarle cualquiera otra información que Ud. interese.

Sin otro particular por el presente, nos suscribimos de Ud. attos. ss. ss. y amigos,

CENTRAL MERCEDITA.  
F. COLÓN MORET,  
*Jefe, Laboratorio Agronómico.*

#### REFERENCES

- VEVE, RAFAEL A.—Our Experience with Cane Varieties. Mem. Assn. Sug. Tech. of Porto Rico, I, 1, pp. 28–31; June, 1922.  
*idem*.—Monthly Reports of the Fajardo Experiment Sta. 1923–26.

D-436.

Received in December, 1924, through the courtesy of Sir John B. Harrison, Director of Science and Agriculture in British Guiana and the originator of this variety. No data as yet available as to the conduct of this cane in Porto Rico.

Recumbent, fair vigor, good stooler. Stalks long and of good girth, green to yellow, heavy dark wax deposit. Internodes long, tumid, slightly staggered, no furrow. Nodes slightly constricted, oblique; growth ring narrow, 2–4 mms., slightly elevated, concolorous; root band wide and oblique, concolorous; rudimentary roots few, small and scattered, 4–5 in rows, purplish to brown; leaf scar glabrate and appressed behind; glaucous band constricted, broad and inconspicuous. Buds extremely small, 4–6 mms., plump, never reaching growth ring, orbicular to keystone shaped, germination subapical, margins narrow, flat, on upper half only, purple, glabrate, no apical tufts, light basal placs. Leaf sheaths extremely lannated at back and sides, green, inner base heavily tinted with purple, slightly glaucous; throat medium width, indistinct, lannated with short appressed hairs; collar wide, reaching midrib, glaucous; ligule narrow except at center, where lower side is concave and nearly even above, ligular process none. Leaf blades spreading with declining tips, medium width, about 6 cms., dark green, margins serrated almost to base, some basal ciliation.

\* D-448. See Plate III, opposite page 191.

This cane was at one time considerably planted at Fajardo, but we have no data concerning its introduction. It seems to have been first planted at this Station in the spring of 1918, presumably with





# PLATE III



D. 448



D. 504



D. 1135



F. C. 214



F. C. 306



H. 109



Jamaica 72



E. K. 28



M. 36 (POJ)

seed from Fajardo. It has been seen elsewhere at the Hatillo Fruit Farm, Mr. Dreier having obtained the seed from Mr. Earle, and at Aguirre, where Mr. Earle also took seed from the Station.

Erect or at length somewhat decumbent, good vigor and stooling, arrows, frequently. Stalks long, medium stout, dull purple fading to dirty brown on maturity, heavy bloom. Internodes medium length, straight or nearly so, cylindrical, or enlarged below, furrow none. Nodes scarcely constricted, somewhat oblique; growth ring broad, a little sunken, greenish or yellowish; root band 8 to 10 mm., greenish: rudimentary roots small, obscure, purplish, crowded in 4 or 5 rows; leaf scar glabrous, appressed behind; glaucous band 8 to 10 mm., scarcely constricted, not conspicuous. Buds broader than long, obtuse, plump, about  $14 \text{ to } 15 \times 12 \text{ mm.}$ , not exceeding the growth ring; margin narrow, uniform, germination dorsal, basal places, moderate, marginal vestiture of medium length hairs and lines of short, white, appressed hairs along all of the vascular bundles of the bud scales. Leaf sheaths with a short, scanty appressed vestiture when young, usually glabrate with age, glaucous, strongly tinted; throat lannate and with a vestiture of rather short whitish hairs; collar reaching the midrib, pallid, lannate with short white hairs; ligule 3 to 4 mm., even; ligular processes none. Leaf blades suberect, the tips drooping, flat, about 7 cm. wide, medium dull green, serrulate to the base, not ciliate.

This cane is not being extended at Fajardo, where it was not considered fully satisfactory. Here and at the Hatillo Farm it is very promising, especially on hill lands. Apparently it needs open, porous soils. It should be tried on the red coral lands. It seems to mature early and promises to be useful for spring planting.

It was not included in the Santa Rita immunity experiments and but little is known regarding its disease resistance.

At Fajardo its record in sugar production is poor, being only 1.61 tons per acre in 1916, 1.87 tons in 1917 and 2.69 tons average on an area of 23 acres in 1919. More recent analyses here are as follows: Its promise of tonnage is better than the average.

Kind	Date	Age	Arr.	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
D-448.....	1-5-21...	Pl. 15 mo. ....	Yes	65.6	18.53	15.96	1.39	86.13	12.38
Cristalina .....	1-5-21 ..	Pl. 15 mo. ....	No	66.6	16.96	15.85	0.56	90.56	11.35
D-448.....	2-9-21 ..	Pl. 16 mo. ....	No	65.6	18.40	16.61	0.87	89.72	13.07
Cristalina .....	2-9-21 ..	Pl. 16 mo. ....	No	68.7	16.20	13.85	0.95	85.49	11.20
D-448.....	4-6-21...	Pl. 18 mo. ....	No	69.4	17.30	15.14	0.65	90.40	12.24

The following analyses have been obtained from 1923 to date:

Variety	Date	Tns. cane per acre	Age	Brix.	Sucr.	Purity	Location	Tns. sug. per acre
D-448 .. .. .	3-19-23 .....	.....	G. C. 18 mos..	20.40	17.18	84.10	Aguirre .....	.....
D-448 .....	Jan., 1925 .....	.....	G. C. 16 mos.	16.50	13.53	81.90	Aguirre .....	4.85
D-448 .....	5-7-23 .....	.....	G. C. 16 mos.	20.70	19.96	96.43	Exp. Sta. ....	.....
Cristalina...	5-7-23 .....	.....	G. C. 16 mos.	20.80	19.92	95.77	Exp. Sta. ....	.....
D-448 .....	Mar., 1924 .....	.....	G. C. 22 mos.	.....	16.16	87.60	Trujillo Alto ..	8.36
Rayada .....	Mar., 1924 .....	.....	G. C. 22 mos.	.....	16.67	88.20	Trujillo Alto ..	0.80
D-448 .....	11-7-24 .....	.....	G. C. 14 mos.	15.75	12.64	80.25	Exp. Sta. ....	.....
D-448 .....	2-9-25 .....	43.20	G. C. 16 mos.	14.40	11.82	82.9	Exp. Sta. ....	8.66
BH10(12) ..	2-9-25 .....	54.81	G. C. 16 mos.	17.43	15.00	86.06	Exp. Sta. ....	6.05
D-448 .....	5-27-25 .....	25.66	Rat. 13 mos...	20.24	18.07	89.28	Exp. Sta. ....	.....
H-109 .....	5-27-25 .....	25.00	Rat. 12 mos...	18.95	16.70	88.10	Exp. Sta. ....	.....

#### REFERENCES

- RICHARDSON KUNTZ, PEDRO.—Ann. Rept. of the Division of Agronomy for the Fiscal Year of 1923-24.—14th Ann. Rept. Ins. Expt. Sta. of the Dept. of Agr. & Labor of P. R., 1923-24, pp. 41-61.
- ROSENFELD, ARTHUR H.—Ann. Rept. for the Year 1923-24. *Ibid*, pp. 62-8.

\* D-504. See Plate III, opposite page 191.

This kind occurred in the variety plot at Fajardo, but there is no record as to its introduction; seed was brought from there to the Station in November, 1919. A thirty-acre field of it was found by Mr. Earle at Río Grande under the name of Java-133 and it also occurred at Humacao as Java-101. Seen elsewhere, at Hatillo Fruit Farm and at Aguirre. A very similar, but distinct, cane occurred at Central Fortuna, Ponce, which was known as "Caña de Vino".

Erect, or at length decumbent, vigorous, good stooler, seldom arrows. Stalks medium length, stout, purple fading to olive, light bloom. Internodes short to medium, stout, strongly enlarged below, subconic, furrow none. Nodes constricted, oblique; growth ring medium to broad, conspicuously elevated, brownish then olive; root band 6 to 8 mm., greenish, tapering downward; rudimentary roots large, brownish, in about 3 rows; leaf scar glabrous, appressed behind; glaucous band constricted, about 8 mm., well marked. Buds small, broader than long, obtuse, plump, about  $9 \times 8$  mm., not reaching the growth ring. margin medium, uniform, germination dorsal, short basal plaes and scanty marginal and apical vestiture. Leaf sheaths with abundant, coarse, assurgent vestiture, glaucous, purplish, usually splitting, throat densely lannate and with longer whitish hairs on margins and behind ligule; collar broad reaching the midrib, pallid but with reddish tinge, glaucous, the margins faintly lannate; ligule long, reaching 5 mm. at center, minutely fimbriate; ligular processes none. Leaf blades suberect, flat broad, 7 to 9 cm.,

dull bluish-green, the midrib often purplish with age, sharply serrulate to the base, sparingly ciliate.

This is a very promising cane but it has not been sufficiently tested to warrant a positive opinion. It has attracted no attention except at the one farm at Río Grande, where it was rapidly extended and at the Hatillo Fruit Farm, where it is doing well. On the Station grounds it has done especially well on the red shale hills, but it has also been satisfactory in low lands. It grows late and has the appearance of a late cane, but the analyses show that it develops sugar early. It is certainly worthy of careful study.

It was in the Santa Rita immunity experiment, but a poor stand was secured and it was in the short list of those which did not contract the mosaic. Nothing is, therefore, really known as to its disease resistance.

The following is its only record for sucrose:

Kind	Date	Age	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
D-504	12-13-20	Pla. 14 mo.	69.2	16.43	13.84	1.88		7.50
Ave. of 5 Cheribon	12-13-20	Pla. 14 mo.			13.69	1.67		11.90
D-504	2-9-21	Pla. 16 mo.	60.4	20.10	18.25	0.77		11.00
Cristalina	2-9-21	Pla. 16 mo.	68.7	16.20	13.85	0.95		11.20
D-504	4-8-21	Pla. 18 mo.	66.6	20.10	18.93	0.408		1.00
D-504	4-8-22	Pla. 12 mo.	75.3	20.21	18.63	0.940		1.00
Cristalina	4-8-22	Pla. 12 mo.	63.6	18.61	17.2	0.877		1.00
D-504	5-8-23	Rat. 12 mo.	62.00	19.90	13.20			1.00
Cristalina	5-8-23	Rat. 12 mo.	55.6	20.80	19.7			1.00
D-504	1-24-3	Pla. 13 mo.		18.41	17.2			1.00
D-504	2-23-3	Pla. 14 mo.		18.80	14.50		77.90	Agüero
D-504	3-22-3	Pla. 15 mo.		18.50	16.16		87.40	Aguirre
D-504	6-7-24	Rat. 21 mo.		19.20	17.27		89.94	Hatillo
B H-10 (12)	6-7-24	Pla. 11 mo.		19.20	16.82		87.60	Hatillo
D-504	6-7-24	Pla. 11 mo.		20.05	15.0		87.60	Hatillo

## REFERENCES

- ROSENFELD, ARTHUR H.—General Variety Studies. Annl. Rept. Ins. Expt. Sta. of P. R., 1923-24, pp. 62-4.  
 VEVE, RAFAEL A.—Our Experience with Cane Varieties. Mem. Assn. of Sug. Technologists of Porto Rico, I, 1, pp. 23-31: June, 1922.

\* D-625. See Plate XXII, opposite page 185.

Introduced from Antigua in 1909 by Mr. Sewall. Probably previously introduced by Mr. Marr of Canóvanas as D-116. Nowhere now grown in pure cultures but abundantly present in mixed plantings in all of the Island, especially in the eastern districts. It was in cultivation at this Station from 1911 to 1916, but had disappeared from the collections until brought in from various sources during 1919.

Erect or at length decumbent, very vigorous, a strong stooler, arrows freely. Stalks long, medium stout, green then yellow, no



flush, little or no bloom. Internodes medium long, cylindrical, straight or nearly so, furrow slight or none. Nodes not constricted; growth ring broad, 3 to 6 mm., swollen, brownish, usually, conspicuous; root band narrow, 6 to 8 mm., whitish then concolorous; rudimentary roots large, scattered, in about 3 rows; leaf scar glabrous, broad and prominent in front, appressed behind; glaucous band narrow, about 3 mm., well marked. Buds broadly triangular-ovate, 12 to 14, 12 to 14 mm., scarcely exceeding the growth ring, margin narrow, uniform, germination apical, basal plate heavy, sides and apex with an abundant vestiture of long brownish hairs. Leaf sheaths glabrate, but with some hairs on median line when young, green, glaucous; throat narrow, pale brown, densely lannate; collar narrow, not reaching the midrib, pale brown, glaucous; ligule broad, reaching 6 mm., even; ligular processes none. Leaf blades spreading, the margins somewhat revolute, 6 to 7 cm. wide, dull green, minutely but sharply serrulate, the base nearly even and sparingly ciliate.

This is one of the most vigorous canes seen in Porto Rico and is probably capable of yielding a higher tonnage than any other one grown on the Island. It is considered, however, to be so low in sucrose that many of the mills refuse to accept it and its planting in pure cultures has been abandoned. On account of its high tonnage many *colonos* still mix as much of it in their fields as they think will pass unnoticed at the mills. Recent analyses indicate that this cane has been entirely misunderstood and that when properly ripened it develops a very satisfactory degree of sucrose. This must be so, since it still furnishes by far the greater part of the sugar made in Demerara over 80%. It needs to be studied anew, but the present indications are that it is a most valuable cane for the red shade hills and probably for the red coral lands or for any other locations where it can be made to mature. It should not be allowed in mixed plantings.

It was not included in the immunity experiment at Santa Rita and but little is known concerning its disease resistance. Stalks of it attacked by gum disease have been seen by Mr. Earle in the Trujillo Alto district. It dies back rapidly after early and prolific flowering—a great draw back.

As reported by McConnie (*Revista*, 1:17, 1918), this kind was second in total sugar at Pajardo as an average of two crops, average cane 38.48; sucrose, 10.3; purity, 78.7; tons sugar, 3.99. This is a good showing, but the cane was evidently green. At this Station, as reported in circular 8, where it appears both as D-116 and D-625,



it took first in tonnage both as plant cane and total per three crops. It seems to have been cut green here also and so took only second place in total sugar, being exceeded by B-1753. The average of the two lots follows: Plant cane, 59.93 tons; three crops, 139.26; brix, 15.26; sucrose, 11.54; purity, 73.1. This would give an average of 3.431 tons sugar per acre for each of the three crops. More recent analyses follow:

Kind	Date	Age	Arr.	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
D-625	11-29-20	Pl. 13 mo.	No	60.3	16.97	13.78	2.23	81.26	12.70
Ave. of 3 Crops	11-28-21	Pl. 13 mo.	No			12.79	1.67	85.88	12.27
D-625	1-5-21	Pl. 15 mo.	No	65.8	16.76	13.85	1.80	82.87	9.57
Cristalina	1-5-21	Pl. 15 mo.	No	66.6	16.96	15.35	0.66	90.85	11.35
D-625	1-10-21	Rat. 14 mo.	Yes	71.2	18.95	17.30	1.00	86.16	12.52
Cristalina	1-10-21	Rat. 14 mo.	No	71.4	17.30	15.34	0.64	86.67	12.01
D-625	1-19-21	Pl. 17 mo.	No	65.0	17.85	14.94	1.70	83.69	12.92
Cristalina	1-18-21	Pl. 16 mo.	No	70.0	17.23	14.96	0.57	82.52	12.95
D-625	2-9-21	Pl. 16 mo.	No	63.4	17.50	14.80	1.78	84.57	13.17
Cristalina	2-9-21	Pl. 16 mo.	No	63.6	16.20	13.85	0.95	85.49	11.20
D-625	2-23-21	Pl. 16 mo.	No	72.6	17.90	15.50	1.59	86.59	12.05
Cristalina	2-23-21	Pl. 16 mo.	No	71.4	18.90	17.40	0.80	92.06	12.58
D-625	4-4-21	Pl. 18 mo.	No	72.4	21.45	19.05	0.59	91.14	11.04
D-625	4-3-22	Pl. 12 mo.	No	72.7	16.69	18.20	3.20	79.09	Station
Cristalina	4-3-22	Pl. 12 mo.	No	63.6	18.61	17.22	0.70	92.50	Station
D-625	5-8-23	Rat. 12 mo.	No	71.6	18.35	15.63	1.41	85.18	Station
Cristalina	5-8-23	Rat. 12 mo.	No	55.6	20.80	19.92	0.54	95.77	Station
D-625	4-9-21	Rat. 12 mo.	No	61.0	18.90	15.58		82.48	Station
BH 10 (12)	4-9-21	Rat. 12 mo.	No	70.0	21.23	21.25		89.77	Station
D-625	1-21-23	Pl. 13 mo.	No		17.10	12.77		74.70	Aguilre
D-625	2-22-23	Pl. 14 mo.	No		19.10	15.92		85.56	Aguilre
D-625	3-20-23	Pl. 15 mo.	No		19.20	15.37		81.00	Aguilre

## REFERENCES

- BROGGLI, CÉSAR.—Memoria de la Estación Experimental de Azúcar, 1910; Lima.
- HARRISON, JOHN B.—Principal Varieties of Sugar Cane under Cultivation in British Guiana During 1923, 1924, 1925. Jour. Bd. Agr. Br. Guiana, XVIII, 2, pp. 108-12; April, 1925.

## A Non-Flowering Strain of D-625.

Mr. W. C. Dreier, manager of the Hatillo Fruit Farm on the Trujillo Alto Road, near the Station, has selected out non-flowering stalks from his D-625 until he had obtained a strain that seldom or never flowers. We have two analyses of this type of cane, one made on 3rd February from cane from Mr. Dreier's place, and the other made from two canes obtained originally from the Hatillo Fruit Farm and brought to the Station from Mr. Fidel Solano's Finca "Monte de Oro", Barrio Monacillo, Río Piedras, a week after the previous analyses. These follow:

Variety	Age as plant	Brix.	Sucrose	Glucose	Purity	Yield factor
D-625 N. F.	20 months	17.45	14.87	2.16	85.21	10.80
BH10 (12)	20 months	17.50	15.93	1.13	90.00	11.91
D-625 N. F.	15 months	18.60	15.90		85.48	

The following analyses were made of this class of 14-month-old cane and of BII-10(12) of the same age from the Hatillo Fruit Farm on 14th May, 1926:

D-625 N. F. ....	14 months ....	19.45	16.72	0.72	87.71	.....
BII (12) .....	14 months ....	18.85	16.80	0.85	89.12	.....

#### D-689.

Another of the promising varieties received in December, 1924, from the originator of this variety, Sir John B. Harrison, Director of Science and Agriculture in British Guiana, whose recent death is so deplored. No data as yet available as to the conduct of this cane in Porto Rico.

Erect, at length recumbent, splendid vigor, excellent stooler. Stalks long, good girth, green to yellow with abundant, narrow, discolored, vertical striations, some bloom. Internodes medium length, decided tendency to split, cylindrical but enlarged at base opposite bud, slightly staggered, no furrow. Nodes constricted, oblique; growth ring very broad, 4-6 mms., elevated, oblique, reddish brown; root band narrow, oblique, covered with reddish wax deposit; rudimentary roots very small, few and scattered, only one to two in rows, inconspicuous; leaf scar glabrate, broad in front and appressed behind; glaucous band broad, constricted and rather inconspicuous. Buds medium size, 7-9 mms., plump, suborbicular, reaching growth ring, germination subapical, margins wide, flat, lannate, extending to base, purple, short apical tufts and light basal places. Leaf sheaths with sparse dorsal ciliation of short tawny hairs, side glabrate, slightly tinted within and without, glaucous; throat broad, lannated, with short appressed hairs, few long and straggling hairs at margins, tendency to split; collar wide and reaching midrib, glaucous; ligule narrow, 2-4 mms., at sides, becoming broader and concave at center, no ligular process. Leaf blades spreading with declining tips, broad, 7-9 cms., dark green, margins uniformly serrated, very scant basal ciliation.

#### D-695.

Another of the promising varieties received in December, 1924, from the originator of this variety, Sir John B. Harrison, Director of Science and Agriculture in British Guiana, whose recent death is so deplored. No data as yet available as to the conduct of this cane in Porto Rico.

Recumbent, fair vigor, moderate stooler. Stalks long and slender to medium girth, green to yellow, slight striations, heavy bloom. Internodes medium length, cylindrical, but slightly enlarged at base

opposite bud, somewhat staggered, decided tendency to split, furrow traces to none. Nodes nearly even, oblique; growth ring narrow, except at outer curve of bends, where it broadens notably, elevated, reddish brown; root band narrow, oblique, covered with dark waxy deposit; rudimentary roots very few and scattered, small, 2-3 in rows, brownish; leaf scar glabrate, broad and prominent in front and appressed behind; glaucous band broad, constricted and inconspicuous. Buds small to medium size, 5-7 mms., ovate not exceeding growth ring, germination apical, margins narrow, flat, glabrate, on upper half only, shouldering at sides, purple, no apical tufts nor basal plaes. Leaf sheaths lannated at back, sides glabrate, inner base slightly tinted, glaucous; throat medium width, dark, lannate with short coarse, appressed hairs, tendency to split; collar broad, reaching midrib, glaucous, brownish; ligule narrow, 2-4 mms., at sides, broadening to 4-6 mms., at center, where it is slightly concave, ligular process short and broad, on one side only. Leaf blades spreading with declining tips, medium width, about 6 cms., dark green, serrated at margins, very scant basal ciliation.

**D-848.**

Introduced from Antigua by Mr. Sewall in 1911. It does not seem to have been planted elsewhere.

Not seen.

**D-1111.**

Introduced from Antigua by Mr. Sewall in 1911. It is mentioned in the Fajardo monthly reports for 1914. This cane seems to have attracted no attention excepting on one farm near Naguabo, and on another near Río Grande, where it is being planted on a large scale. In both cases it was on hill land and doing much better than Rayada or any other kind planted there. It is a clean-growing, upright, brownish cane. Seed brought to this Station in January, 1921. It made a good germination.

**D-1135.** See Plate III, opposite page 191.

Introduced from the Hawaiian Islands via Washington, by this Station in January 1921. Its good germination was most notable from the first and it has been rapidly multiplied for tonnage and substitution experiments, as well as for seed distribution. Considerable quantities have been sent to the Island of Vieques, where it has done remarkably well under the distressing conditions for cane growth on that island. Fair amounts, too, have been supplied to the Bayaney, "Los Caños" and Plazuela properties of the Giorgetti company, all located in districts where mosaic disease has become

most firmly established and where roguing is a commercial impracticability. It has done particularly well on the hilly Bayaney property, and on the rich *vegas* of "Los Caños" has also shown up well, but it is not apparently adapted to the *semi-poyales* at Plazuela and its cultivation will be discontinued there. At the Hatillo Fruit Farm, on shaly red hillsides, General Manager W. C. Dreier, who has furnished us with so many useful observations on varieties under those conditions, has obtained most satisfactory results where most other canes, outside of the North Indian or P.O.J. types, do not grow at all. It is highly resistant to Mosaic Disease, though perhaps not so much so as in the cases of P.O.J. 36 and 213. Tried out in the Argentine a decade ago by the writer, it came next to the above P.O.J. canes in general promise and proved to be a most excellent ratooner for many years.

This cane was sent by the Department of Agriculture and Science of British Guiana, where it was considered a complete failure under Demerara conditions, to the Australian Sugar Refining Co. at Sydney, Australia, along with some fifty to sixty other varieties, some thirty years ago, and has rapidly become the most prominent variety in Queensland. In 1920 Easterby reported it to be more resistant there to grubs than either Badila or Goru and that it was coming rapidly into prominence in the Cairns district, 50 per cent of the cane then being planted at Mossman being reported as of this variety. The Entomologist of the Bureau of Sugar Experiment Stations, Mr. J. F. Illingworth, in 1920 and in several earlier reports called attention to the deep-rooting habit of this cane and to its comparative resistance to the attacks of grubs:

"In making further study the past season, I find much to recommend D-1135 as a cane for the volcanic, red, grub-infested soils. A remarkable instance is a field of three varieties planted for experiment in an area invariably devastated by grubs at Maringa. D-1135 has Badila on one side and Goru on the other. The grubs have killed the Badila and badly injured the Goru while the 1135 is hurt but little, standing out in marked contrast between the two devastated plots with its dark-green color and superior height."

Illingworth also reports success in grub control with arsenic applied in drills with seed at the rate of 60 to 100 pounds per acre.

In Hawaii, too, this variety has become very popular of late years and is rapidly replacing the famous "Tip" canes on the higher and poorer lands. In the Bulletin of the Hawaiian Sugar Planters' Experiment Station, Vol. III, Pt. 1, p. 10, the statement is made that "This cane is so resistant to mosaic that practically it may be



called immune'', but Cross in 1921 stated that ''In Tucumán it has not demonstrated a very marked resistance, although, amongst the non-immune varieties that we have, it is certainly one of the most resistant. . . . It has the advantage over the P.O.J. 36 and 213 . . . of not suffering from rapid inversion immediately after cutting.''

Erect, splendid vigor, fine germinator, arrows prolifically. Stalks long and rather slender, reddish purple, some bloom. Internodes medium length, cylindrical, slightly staggered, furrow slight to none. Nodes even; growth ring broad and even, parallel, yellowish green; root band wide, oblique, yellow; rudimentary roots fairly abundant, conspicuous, 3-5 in rows, purple; leaf scar glabrate, appressed behind; glaucous band narrow, slightly constricted and poorly defined. Buds small,  $8 \times 10$  mm., scarcely exceeding growth ring, orbiculars, germination subdorsal; margins broad, flat, glabrate, purplish, distinctly shouldered above, very light basal places. Leaf sheath with heavy dorsal vestiture of long tawny hairs, sides glabrate, glaucous, purple, inner base slightly tinted with purple; throat narrow, inconspicuous glabrate except for long marginal tufts; collar narrow, reaching midrib, glaucous; ligule medium width, 3-5 mm., nearly even, ligular process none. Leaf blades erect, narrow, 4-6 cm., dark green, margins minutely and uniformly serrulated.

In an experiment with the sixteen most promising varieties of cane at the Station, planted in October, 1924, D-1135 was fifteen days ahead of all others in germination and in germination counts made in this plot until the cane closed, it consistently held first place by a wide margin. Grown for seed distribution on a poor, red clay hillside at the Station in extension of about an acre and cut at from eight to twelve months, this variety has consistently yielded around thrity-five tons per acre both as plant and stubble. It was reported as a disappointment at Central Aguirre, but Mr. R. L. Page, in charge of cultivation at Guánica Centrale, wrote us in regard to D-1135 on 20th June, 1925:

''We have a small field planted in Santa Rita on hillside land which looks very promising. We have some of this variety in Hormigueros and Añasco district.''

From San Antonio de los Baños, in Havana Province, Cuba, Mr. Richardson Kuntz wrote us about the same time:

''Of Demerara canes, we have here 1135, 117, 109, 216, 99, 74 and 625, and of all these the D-1135 is the best germinated and most prolific, but it suffers considerably from drought.''



The following analyses have been made:

Location	Date	Age	Mill	Tons Cane p. a.	Brix.	Sucr.	Purity	Tons Sugar p. a.
Cent. Aguirre.....	1-28-23	13 mo....	Hand	.....	18.10	15.45	85.90	.....
Cent. Aguirre.....	11-22-23	14 mo....	Hand	.....	18.20	15.17	88.40	.....
Cent. Aguirre.....	11-19-23	15 mo....	Hand	.....	19.60	16.62	88.20	.....
Ins. Station.....	May, 23	Rat. 12 mo....	Hand	.....	19.70	18.05	91.62	.....
Cristalina.....	May, 23	Rat. 12 mo....	Hand	.....	19.90	18.84	94.67	.....
Ins. Station.....	May, 25	12 mo....	Cent.	40.00	16.80	14.23	84.70	4.15
Ins. Station.....	11-9-25	16 mo....	Cent.	55.76	14.90	12.53	84.90	5.08
B 11-10 (12).....	11-9-25	16 mo....	Cent.	54.31	17.43	15.00	86.06	6.05
Huailo Frt.....	V-14-25	14 mo....	Hand	.....	18.10	16.20	91.01	.....
B 11-10 (12).....	V-14-25	14 mo....	Hand	.....	18.85	16.80	89.12	.....
B 11-10 (12).....	V-14-25	14 mo....	Cent.	24.10	.....	15.81	87.60	2.82
B 11-10 (12).....	V-14-25	14 mo....	Cent.	21.80	.....	17.90	89.36	2.92

In the Station tonnage experiment in comparison with B11-10(12), figures for which are given at the foot of the above table, these canes were all planted on good *vega* land, on which it is not likely that the D-1135 can compete with B11-10(12), although it stood fourth out of sixteen varieties in this experiment in production of sugar per acre. It is under unfavorable conditions, both climatic and from the disease standpoint, that this cane shows up to the best advantage and results of some of the substation tests under such conditions will give us much more substantial data as to the comparative value of this promising variety.

#### REFERENCES

- EASTBRY—Queensland Journal, Sept., 1920, p. 143.  
 ILLINGWORTH, J. F.—Report of the Entomologist. *Ibid.*, p. 148.  
 D-1135 *Striped*. Mr. Luis Serrano, Assistant Agronomist of the Station has found and bred true to type a striped sport of D-1135, which, in everything but color, seems identical to the usual type. Comparative experiments with this sport are planned.

#### D-1170.

A cane grown under this number was seen by Mr. Earle at Central Coloso in August, 1919. Not seen elsewhere and we have no knowledge of its origin.

#### D-4395.

A cane under this number was noted by Cowgill, July, 1913, at Dolores, Rio Grande. We have no other knowledge of this kind.

#### Diamond-185.

The Diamond Seedlings were produced at a plantation of that name in Demerara. This one was imported by this Station from Barbados in 1911. Its record was nearly equal to Cristalina, both in tonnage and sucrose.

Not seen.

## REFERENCES

BOVELL, J. R., & D'ALBUQUERQUE, J. P.—Seedlings Canes and Manual Experiments for the Season 1909-11. Local Dept. of Agr., Barbados.

*Idem.*—*Ibid.*, Season 1911-13.

Diard.

Imported by Dr. Grivot Grand Court prior to 1879. Mentioned by both Stahl and López Tuero. As nearly as can be determined this = *Cristalina*. The striped form mentioned by López Tuero = *Rayada*.

Egyptian.

See Java 105-P.O.J. and Plate XIII, opposite page 209.

\* Elephant.

(= *Gigante*.) Introduced from Trinidad by Dr. Stahl prior to 1879. Only seen in the experimental plots at Central Fajardo.

Erect, late, long-continued growth, no arrows. Stalk very brittle medium tall, very stout, 5 cm. or more, dull purple, very heavy bloom. Internodes short, 5 to 8 cm., nearly straight, cylindrical or the shorter ones barrel shape, furrow none. Nodes scarcely constricted, nearly perpendicular; growth ring narrow, concolorous, a little sunken, being usually the narrowest part of the stalk; root band about 10 mm., concolorous; rudimentary roots obscure, in about 4 rows; leaf scar glabrous, short, appressed behind; glaucous band obscured by the bloom of the internode. Buds hemispheric, about 11 mm. in diameter, margin abruptly widened at the middle where it forms an obtuse sterile apex fully 3 mm. long, forming a very conspicuous character, exceeding growth ring only by this sterile apex, germination dorsal, glabrate except for places of short appressed hairs at base. Leaf sheaths with a heavy vestiture of stiff assurgent hairs usually splitting down the back, strongly pouched below the bud, green or somewhat tinted, heavily glaucous, stained purple within; throat very wide, glaucous, usually with transverse cheeks, glabrate except for scattered tufts of hairs at margins, collar very wide, conspicuous, reaching the midrib, heavily glaucous, not lannate; ligule short, 2 to 3 mm., even; ligular processes none. Leaf blades long, spreading, somewhat revolute, very wide,  $7\frac{1}{2}$  to 9 cm., gray-green, minutely serrulate, the base slightly ciliate.

It is said to be low in sucrose. Probably of no commercial value, but of considerable historic interest. It represents a rather distinct type.

Guingham.

López Tuero page 9. Here this name seems to = Rayada. There is no evidence of the occurrence on the Island of the true Guingham = Striped Tanna.

Hawaii-109. See Plate III, opposite page 191.

Seedling of Lahaina. Male parent probably Rose Bamboo. This now world famous cane, which holds all records for production of sugar per acre and which in Hawaii's 1925 crop, occupied 30 per cent of the cane area of those islands, came to us from Hawaii in early 1924 with the halo surrounding its tremendous yields in that progressive country, some of them equalling in sugar produced per acre the quantity of cane produced per acre in many sugar sections. It has previously and since been surreptitiously introduced to the Island by enthusiasts who have read of its Hawaiian behavior.

Erect, good vigor, fine stooler, arrows freely. Stalks long, good girth, greenish pink to dark purple becoming reddish brown on maturity, heavy deposit of grayish wax becoming dark with age. Internodes medium to long, somewhat staggered, cylindrical, slightly appressed at sides and enlarged at base opposite bud; furrow traces to none. Nodes oblique even, or slightly elevated; growth ring broad, nearly even, green to concolorous; root band wide, oblique, light green to concolorous; rudimentary roots large, conspicuous, numerous, 3-4 in rows, purplish to concolorous; leaf scar glabrate and appressed behind; glaucous band broad, nearly even, inconspicuous. Buds medium size, reaching growth ring, plump, green to red and purple, orbicular, germination subdorsal; margins narrow, flat, glabrate, purple, concave at center, but sometimes acute, wider at upper sides, gradually narrowing and ending at middle point of bud, short apical tuft, scanty lannation along fibro-vascular bundles, light basal places. Leaf sheaths with abundant dorsal lannation, sides glabrate, greenish purple; inner base slightly tinted with purple; throat broad, covered with short appressed hairs, dark and well defined, tendency to split; collar broad, reaching midrib, glaucous; ligule medium width, nearly even; ligular process on one side only, short and stubby, deciduous. Leaf blades erect with declining tips, medium width, dark green, margins minutely and uniformly serrulated to base, long and abundant basal ciliation.

The writer has constantly taken the position with inquiring planters that the enormous yields of this variety on the best lands of Hawaii—and it is planted only under the most favorable conditions of both soil and climate—with the unheard-of (in Porto Rico) quan-

tities of fertilizer and water applied, should not in the least be taken as a criterion of the value of this variety under the very diversified conditions of the "Isle of Enchantment". But such advice has not prevented the purchase of small quantities of this seed—or what was supposed to be this seed—at fabulous prices from anyone who claimed to have any of it. Results both at the Station and out on the Island in general, even under the most favorable conditions for this type of cane on the South Coast, have fully borne out the always sane practice of never trying to apply the results of work in one country to the distinct conditions of another without preliminary trials.

Planted on both *vega* and hill lands at the Station, in the former case in comparison with BII-10(12) and in the latter with D-109 and 1135, II-109 has never equalled its checks in general appearance, disease resistance or yield, while on the South Coast, where conditions are the nearest possible to adequate for this variety, in all comparative plantings of this variety with BII-10(12), the latter has always turned out definitely superior to the II-109. This applies to plantings on a fair-sized scale seen at Santa Rita, Guayanilla, Fortuna and Aguirre. In a tonnage experiment planted out in the fall of 1925 at the Station, the II-109 is showing up very poorly and in various points on the Island it has proven to be highly susceptible to *Helminthosporium* leaf spot, from which it suffers more seriously than any other varieties in Hawaii, as well as to mosaic disease and gumming.\* Mr. W. C. Jennings, Associate Agriculturist of the Hawaiian Sugar Planters' Experiment Station, after a trip over the Island with the writer to all points where II-109 was being grown to any appreciable extent in January, 1925, expressed the opinion that there is no future for this variety in Porto Rico.

The author tried out II-109 in Argentina many years ago, before it had become so famous, and it turned out an absolute failure under those subtropical conditions. Under date of 28th January, 1925, Mr. F. S. Earle wrote us from Cuba:

"II-109, while doing fairly well on red land, is a complete failure on Calvino's plots on thin, black, coco, subsoil land. It is shot to pieces by cankerosis."

while Mr. P. Richardson Kuntz said in a letter to the writer on 30th May, 1925:

"The II-109 does not prosper here (Province of Havana). It suffered severely from the drought. Don't think she'll ever amount to anything in Cuba."

\* The II-109 has proven to be very susceptible to gumming disease and is being rapidly eliminated throughout the Island.—C. E. CHARDÓN (July 1927).



## REFERENCES

- ROSENFELD, A. H.—Cañas de Semillero de Hawaii. *Revista Industrial y Agrícola de Tucumán* (Argentina), Año IV, 3, p. 96. Ag., 1913.
- VERRET, J. A.—An Acreage Census of Cane Varieties for the Crops of 1923, 1924, 1925. *Hawaiian Sug. Plant. Expt. Sta., Circ. 41.* 1924.

Jamaica-72. See Plate III, opposite page 191.

Sent from Jamaica by Director R. Menéndez Ramos, of the Insular Experiment Station of Porto Rico, while visiting that island, in July, 1924. The seed arrived in bad condition and 80 per cent failed to germinate and we have had to rogue so constantly on account of severe mosaic infection, in a plat where other varieties showed no signs of the disease, that we have been unable to multiply it to sufficient quantity to start tonnage experiments. Hardly seems promising for Porto Rico.

Erect, fair vigor. Stalks long, medium girth, green, light bloom, no flush, discolored striations and sometimes spots. Internodes long, appressed, slightly staggered, furrow none. Nodes slightly constricted, oblique; growing ring medium width and slightly elevated, brownish red changing to concolorous; root band wide, oblique, concolorous, light wax covering; rudimentary roots conspicuous, crowded, 3-5 in rows, brown; leaf scar glabrate, appressed behind; glaucous band slightly constricted, narrow and only fairly well defined. Buds medium size, 9-11 mm., never reaching growth ring, orbicular germination dorsal, margins narrow and flat, lannate along fibro-vascular bundles, abruptly shouldered above, purple, heavy basal plaes. Leaf sheaths with scanty dorsal vestiture of tawny hairs, sides glabrate, glaucous, green, inner base slightly stained with purple; throat broad and well defined, lannate with closely appressed short hairs; collar medium width, reaching midrib, glaucous; ligule broad, 4-6 mm., nearly even, ligular process none. Leaf blades spreading with declining tips, medium width, about 6 cms., dark green, margins minutely and uniformly serrulated, sparsely ciliate at base.

## THE JAVA SEEDLING CANES

The best known series of Java seedlings are the famous P.O.J. canes bred by Kobus and his successors, although the most widely cultivated Java seedling in its country of origin today is the E.K.-28. Kassoer is also included amongst the Java seedlings described in the following pages, also one representative of the Tjepering series.



**E.K.-28.** See Plate III, opposite page 191.

Produced by E. Karthaus by crossing P.O.J. 100 as mother and E.K. 2 as father. Brought to the Station from the Federal Station at Mayagüez in December, 1924, through the courtesy of Plant Breeder Davis of that staff. In tonnage experiments at the Station on low, poorly drained *vega* soil, it has not shown up too well, although it is of fair appearance and promises good tonnage. At the "Los Caños" substation it does not look especially well on very good *vega* land, but at Central Constanencia in 1925 a small field of an unknown variety, which looked superior to any cane on the estate, was identified by the writer as E.K.-28 and is being rapidly extended by Mr. Manuel del Valle there. A few stools seen at the Mayagüez Station certainly had attained most excellent development, although some seed obtained from those same stools failed to do at all well for Mr. Dreier on rather inferior shaly hill land at the Hilitillo Fruit farm near the Station. Unfortunately, this excellent cane is decidedly susceptible to gumming.

Mr. J. van Haareveld in 1924 stated that E.K.-28 occupied 43.75 per cent of the total cane area of Java, a percentage which it seems to have maintained since.

Erect, fine vigor, good stooler, flowers prolifically. Stalks long, yellow base color, becoming dark amber, with reddish brown flush on exposure to sun, short, dash-like, discolored checking. Internodes long, cylindrical, slightly enlarged at base, not staggered: furrow pronounced, flat and wide, becoming narrower and deeper in older internodes. Nodes even, parallel: growth ring medium width, prominent, bright green on bud sides and bright red behind, later changing to uniform purple brown; root-band broad, distinct, parallel, at first white, changing through light green to brownish green: rudimentary roots few and scattered, conspicuous, 3-4 in rows, light purple to reddish brown; leaf scar glabrate, appressed behind: glaucous band conspicuous and broad. Buds at first large, flat and decidedly lanceolate, changing with age to smaller but plumper, orbicular-ovate type,  $8 \times 10$  mm., when young exceeding growth ring by one-third to one-half, later scarcely exceeding growth ring, germination subapical, margins narrow, flat, sparsely lannated, very pronounced apical tufts of long, coarse, white hairs, no basal plaes: Leaf sheaths with scanty dorsal vestiture of short deciduous white hairs, glaucous, heavily splotted with purple: inner base lightly tinted; throat broad and conspicuous, lannate, with long deciduous hairs at margins; collar wide, reaching midrib, glaucous: ligule narrow at margins, abruptly widening and becoming peaked at center,

fimbriatè, with characteristic tip; ligular process, small, broad, blunt, inconspicuous and on one side only. Leaf blades spreading with decidedly declining tips, very broad, 10-12 cms., dark green with very broad white midrib, very minutely and uniformly serrulated, sparse basal ciliation on young leaves only.

## REFERENCES

DEERR, NOEL.—Cane Sugar, p. 39. London, 1921.

HAAREVELD, J. VAN.—Java Archief, Med. No. 5, pp. 169-250.

Kassoer. See Plate V, opposite page 239.

This is a cross between the wild *Saccharum spontaneum* and Cheribón which, on account of its notable resistance to Sereh and mosaic disease, as well as its remarkable development under even the most adverse conditions, is being widely used in Java and by Brandes in Florida for the production of crosses from known parents. It has never been accused of having any sugar content anywhere, although one factory analysis made at Central Vannina the 26th May, 1926, of nineteen month *gran cultura*, did show a *Brix* of 15.53, a sucrose content of 11.46 and a purity of 74.70—probably the highest recorded analysis for this variety. It was obtained in May, 1924, from Dr. E. W. Brandes, Senior Pathologist in Charge of the Sugar Plant Investigations of the U. S. Bureau of Plant Industry.

Erect, splendid vigor, stools prolifically, light arrower. Stalks long, slender to medium diameter, red to purple, extremely heavy and uniform bloom. Internodes very long, 12-14 inches, cylindrical but enlarged at base, not staggered, no furrow. Nodes constricted, almost parallel; growth ring prominent, conspicuous, green, through yellow and red to concolorous; root band very wide and slightly constricted, nearly parallel, green then red to concolorous; rudimentary roots rather few and scattered, inconspicuous, 4-5 in rows, purple to concolorous; leaf scar glabrate, appressed behind; glaucous band inconspicuous and nearly even. Buds varying from small to medium, not reaching growing ring, oval, germination subapical, margins on upper half only, flat, sparsely lannated, no basal plaes. Leaf sheaths with scanty dorsal vestitures, side glabrate, green, slightly glaucous, inner base slightly tinted with purple; throat wide and distinct, covered with abundant vestiture of long coarse hairs; collar wide and rather conspicuous, reaching midrib glaucous; ligule medium width, 2-5 mm., slightly fimbriate; ligular process very long, up to 7 cms., on young canes, deciduous. Leaf blades spreading with declining tips, narrow, 6-8 cms., dark green, minutely and uniformly serrulated and ciliated except at base.

The well-known Tjepering series of seedlings in Java are crosses of Kassoer and Cheribón canes.

At four months of age on poor, red, clay hillside land at the Station this fast-growing cane had already developed six to seven long joints on the average. One such stalk, having eight well-formed internodes was given Mr. Dreier to plant at the Hatillo Fruit Farm in order to see if the variety would reproduce itself at this early age. Mr. Dreier planted each one-eye seed piece in a distinct hole and obtained just eight fine stools of this variety, using eight similar seed pieces of Cayanna for a check on the germination. In nine days the Kassoer was 100 per cent germinated, while the Cayana showed just one sprouted eye. Seven days later Cayana showed just two sprouted eyes and only three two days after that. It was twenty-five days before Cayana showed 100 per cent germination.

#### REFERENCES

- CROSS, W. E.—Revista Industrial y Agrícola de Tucumán, Argentina, XIV, p. 97. 1923.  
ROSENFELD, ARTHUR H.—Informe Anual del Tecnólogo Especial para Cañas. Informe Anual de la Est. Exptl. Insular de Puerto Rico, Año Fiscal 1923-24, pp. 69-76.

#### THE P.O.J. SEEDLINGS

Very shortly after the recognition of the fertility of true cane seed in 1888-89 by Harrison and Bovell in Barbados and Soltvedel in Java, working completely independently, extensive breeding of varieties from known parents was commenced by Kobus and Wakker at the Proefstation Oost Java (hence the initials P.O.J.), or East Java Experiment Station. Kobus and Wakker employed the Indian cane Chunnee (one of the Sarethra class), a variety of enormous vigor and high resistance to disease under unfavorable conditions, as the male parent in these crosses, and the Black Cheribón and Striped Preanger, corresponding to our Morada and Rayada, as the female. This combination was used with the object of obtaining a "hybrid" with the seed-resistant qualities of Chunnee and the very desirable cultural and manufacturing qualities of the female parents, then in common cultivation in Java. In later year Kassoer, E.K.-28 and other canes have been substituted as parents, but the majority of these canes described in the following pages are of the Chunnee X Cheribón strain, as will be seen from the notes on parentage thereto appended, and partake of the characteristics of the greater number of the varieties produced by these crosses, *i. e.*, they all have long, narrow leaves, long thin joints, extremely hard rind and a modified central

fistula. In referring to the parentage the male parent is given first in each case. Colors mentioned refer only to that of the mature cane.

## REFERENCES

- JESWIETT, J.—Beschrijving der Soorten van het Suikerriet. Java Archief, Med. VI, 7 and 8. 1916.  
ROSENFELD, ARTHUR H.—Las Cañas P.O.J. de Java. Inf. Ann. de la Est. Expt. Insular de Puerto Rico, 1923-24, pp. 74-5.

Java 36—P.O.J. See Plate XXIII, opposite page 209.

A cross of Chunnee with Striped Preanger. (By an error first recorded by Earle as Java-56.)

Imported from the Argentine in 1917 by the Mayagüez Station. Sent out by them to various parts of western Porto Rico. Included in the Santa Rita immunity experiment, where it took the highest rank in resistance to both root disease and mosaic. It is a strong ratooner and gives heavy tonnage, but hardly equal to Uba in this respect. In the Argentine it matures earlier than Uba and is now one of their two chief commercial canes.

Erect or at length somewhat declined, very vigorous, a strong stooler, arrows frequently. Stalks long, slender, usually less than  $2\frac{1}{2}$  cm., brownish purple, little bloom. Internodes long straight, cylindrical, furrow scarcely evident. Nodes broad, prominent, not constricted; growth ring narrow, conspicuous, greenish; root band broad; rudimentary roots inconspicuous; purplish, in about 3 rows; leaf scar glabrous; glaucous band conspicuous, not constricted. Buds large, broader than long, margin broad, uniform. Leaf sheaths glabrate, purplish, throat minutely lannate and with a scanty vestiture of long hairs; collar narrow, inconspicuous, not reaching the midrib; ligule abruptly broadest at the center (as in Uba); ligular processes none. Leaf blades spreading, narrow, long acuminate, weakly serrulate to the base.

The following yields and analyses have been recorded from around the Island:

Variety	Location	Age	Tns. cane per acre	Brfx.	Sucrose	Purity
P. O. J. 36.	Añasco	G. C.	45.00			
P. O. J. 36.	Añasco	1st Rat.	13.50			
B. H. 10 12)	Añasco	3rd Rat.	25.50			
P. O. J. 36.	"Los Caños"	G. C.	41.85			
Ravada	"Los Caños"	G. C.	18.40			
P. O. J. 36.	"Los Caños"	G. C.		14.27	14.27	85.25
P. O. J. 36.	"Los Caños"	G. C.		17.81	14.66	87.51
Ravada	"Los Caños"	G. C.		17.12	12.45	81.50
P. O. J. 36.	Rincón	G. C.		14.84	16.36	85.66

These figures are taken from the writer's work on "The Java P.O.J. Canes in Tucumán and Porto Rico", to which the reader is referred for data on dates of analyses, general conduct, etc.







P. O. J. 36



P. O. J. 213



P. O. J. 105

## REFERENCES

- ROSENFELD, ARTHUR H.—The Java Canes in Tucumán. Some Large-Scale Results. *International Sugar Journal*, 1920, p. 22.  
*idem.*—The Java P.O.J. Canes in Tucumán and Porto Rico. *Jour. Dept. Agriculture of Porto Rico*, VIII, 3; July, 1924.

**P.O.J.-36(M).** See Plate III, opposite page 191.

This is a sport of P.O.J.-36, originated by Versteegh at the Sugar Experiment Station at the town of Shinka. The "M" stands for Mingka, which means "Stripe"; distinguished from P.O.J.-36 by small stripes in the immature internodes. It was imported by the S. P. I. of the U. S. Bureau of Plant Industry from Formosa. Through Dr. E. W. Brandes, Senior Pathologist in Charge of the Office of Sugar Plant Investigations of that Bureau, we obtained, a cutting of this cane in May, 1924. From the first, even though planted on extremely poor red clay hill soil, it made remarkably good development and when planted out for extension in *vega* land under extremely moist conditions, it distinguished itself for its vigor, even in comparison with P.O.J.-36 and *Kassoer*.

Erect, fine vigor. Stalks long and slender (about diameter of P.O.J.-36), green base, overlaid with rose to purple, heavy bloom. Internodes long, cylindrical, slightly staggered, furrows slight to none. Nodes wide and prominent, oblique, growth ring medium width, even with internodes, green changing to light reddish brown; root band wide, well defined, elevated, concolorous, with waxy covering; rudimentary roots small, inconspicuous, very few and scattered, 2-3 in rows, purplish to concolorous; leaf scar glabrate, broad and prominent in front and appressed behind; glaucous band fairly conspicuous, but not well defined, almost even. Buds medium size,  $8 \times 10$  mm., plump, scarcely exceeding growth ring, orbicular, germination subapical, margins very narrow and on upper half only, with abundant vestiture of fine fawny hairs, distinct apical tufts of short hairs, light basal places. Leaf sheaths glabrate, slightly glaucous, somewhat tinted, inner base lightly stained with purple; throat broad, lannate with long marginal tufts; collar wide and inconspicuous, reaching midrib, glaucous; ligule wide 4-6 mm., nearly even; ligular process short and stubby, on one side only, apparently deciduous. Leaf blades erect with declining tips, narrow, 4-6 cms., dark green, upper two-thirds minutely serrulated, no basal ciliation.

Mr. R. L. Page, Manager of Cultivation for Russell & Co., at Guánica Centrale, wrote the author under date of 20th June, 1925:

"I secured a few of the seeds at the same time that I got the P.O.J.-36 (in April) and I believe that this variety is making a better growth."

At the plantations at Bayaney, under typical hill conditions, at "Los Caños", on good vega land, and at the Hatillo Fruit Co. Farm on poor red clay hillside, it is doing extremely well, as well as in the tonnage experiment on poor vega land at the Station. Seems a very promising variety.

#### P.O.J. 105

According to Cowdell's notes, such a cane was in the Fajardo collections in 1914. It is not to be found there now. It probably came in the direct importation mentioned by Mr. May.

This was about the best looking of the earlier P.O.J. seedlings, being an ambar colored cane of very good grain. As plant cane in our early experiments with these varieties in Tucumán in 1911 it gave very promising results and one plantation in Argentina extended it very rapidly for a couple of years. It proved to be a very inferior ratooner to the P.O.J. 36, 105, 213, 222 and 234, however, and also suffered to a certain extent from mosaic disease in Tucumán and from scorch in Java, in both of which countries its cultivation was ultimately abandoned.

#### REFERENCES

- BLONDE, R. E.—Variedades de Caña. *Revista Industrial y Agrícola de Tucumán*, II, 2, pp. 73-98. Jul., 1911.  
 ROSENFIELD, ARTHUR H.—Diez de las Cañas más prometedoras que están Experimentándose en la Estación Experimental. *Ibid.*, III, 2, pp. 109-33. Ag., 1912.

\* Java 105 P.O.J. See Plate XXIII, opposite page 209.

(Also known as Egyptian cane.) Parents Chunnee X Striped Picanger. Probably included in the importation from Egypt mentioned by Mr. May (see letter). This cane was first seen by the writer in the Argentine some fifteen years ago and Mr. Earle reports seeing it first in the fall of 1913 at Central Córaca in western Porto Rico. It was growing vigorously, notwithstanding a complete infection with mosaic, and presented a striking contrast to the Rayada and other kinds which were all seriously injured by mosaic. It was called "Egyptian cane" and seed was said to have come from the Mayagüez Station some five years before. Later the same cane was seen in the outskirts of Mayagüez, where it was being called "Pe-sante cane" after the owner of the farm where it occurred. This cane for a while attracted much attention and was widely planted in the extreme western districts. From the full description published by Fawcett (*Rev. Indust. y Agric. de Tucumán*, 9:142, 1919) it seems quite certain that this is 105 P.O.J. It came to the Argentine from Egypt and is known as *Ambar de Egipto*. A note in our files

shows that on October 24, 1914, six varieties of Egyptian canes were received from the Mayagüez Station, but there is no data as to what became of them. This one can not be traced among them.

Erect, vigorous, strong stooler, arrows freely. Stalks tall, slender, usually, less than  $2\frac{1}{2}$  cp., brownish, very heavy bloom. Internodes long cylindrical or a little compressed, furrow evident. Nodes prominent, enlarged; growth ring broad, even, yellowish; root band broad; rudimentary roots inconspicuous, purplish, in about 3 rows; equal on all sides, not compressed behind, the widest part of stalk; glaucous band indistinct, obscured by the bloom of the internode. Buds large, triangular, margin wide, strongly shouldered (as in *Cristalina*), nearly glabrous. Leaf sheaths glabrous, tinted; throat slightly lannate, with scanty tufts of hairs on the margins; collar glaucous; ligule broad, broadest at center; ligular processes none. Leaf blades suberect but tips declined, long, narrow, bright green, scarcely serrulate, nearly even.

Like the other P.O.J. hybrids this cane is very resistant to both root disease and mosaic. It is in no sense immune to the latter disease like the *Uba*, since every stalk seen of it is infected, but it does not stop its growth. It was strongly recommended by Earle for the heavily infected western districts where it was extended very rapidly for a few years, but it seems evident now that P.O.J.-36 is superior to it. In the Argentine it is considered to be late in maturing. Here its sucrose content is not entirely satisfactory either, both P.O.J. 36 and 213 generally surpassing it in this respect. An analysis of 14-month arrowed plant cane brought by Mr. Earle from Rincón, December 1, 1920, showed: extr., 68.4; brix, 16.50; sucrose, 13.11; R. S. 2.72; purity, 79.45; fiber, 13.27. This is not bad, compared with other canes at this early date, but the large amount of reducing sugars and the low purity show that the cane was still very green. A few other results over the Island follow:

Variety	Location	Age	Tns. cane per acre	Brix.	Sucrose	Purity	Date
P. O. J. 105	Mayagüez	17 months	42.00				1924
P. O. J. 36	Mayagüez	17 months	52.14				1924
P. O. J. 105	Añasco	1st Rat.	35.00				1924
P. O. J. 105	Añasco	1st Rat.	35.00				1924
B. H. 101 (12)	Añasco	3rd Rat.	35.00				1924
P. O. J. 105	"Los Caños"	G. C.	49.98				1924
Rayada	"Los Caños"	G. C.	14.15				1924
P. O. J. 105	"Los Caños"	G. C.		15.03	12.44	82.87	1-24-24
P. O. J. 36	"Los Caños"	G. C.		17.12	14.98	87.51	1-24-24
Rayada	"Los Caños"	G. C.		14.84	12.15	81.56	1-24-24
P. O. J. 105	"Los Caños"	G. C.		15.81	12.48	78.60	1-24-24
P. O. J. 36	"Los Caños"	G. C.		16.84	14.87	88.35	1-24-24
P. O. J. 105	Rincón	G. C.			15.06	89.23	Jan., 24
P. O. J. 36	Rincón	G. C.			16.36	85.06	Jan., 24
P. O. J. 234	Rincón	G. C.			16.08	85.27	Jan., 24
P. O. J. 105	Cambalache	G. C.		18.00	14.87	82.07	4-8-24
P. O. J. 213	Cambalache	G. C.		16.65	14.33	86.07	4-8-24



These small series of data on cultural yields and chemical analyses under comparative Porto Rican conditions show us that the P.O.J.-105 has behaved here in a surprisingly similar manner to its conduct in Tucumán, Argentina, in relation to the P.O.J.-36 and 213, which are the canes with which it should logically be compared. In Tucumán we found that the P.O.J. 36 and 213 far outdistanced the 105 in yield of cane and sugar per acre under comparable conditions, as well as in tolerance of their 100-per-cent infection with mosaic disease and to various root troubles. As an early maturer P.O.J.-234 was superior to all others in Argentina, but its cultural yield was never so high as the others and it cannot compare with either of the others in long ratooning qualities. The P.O.J.-105, however, certainly stood at the bottom of the list of these four canes in Tucumán in point of cultural and factory yield, years of ratooning, early maturity and resistance to mosaic and other diseases. A glance at the Mayagüez results shows that P.O.J.-36 outdistanced the "Egyptian" by around ten tons of cane per acre, while at Añasco B.H. 10(12) as third ratoons gave superior results to P.O.J.-105 as first. While actual comparative tonnage data is lacking from "Los Caños", where there are large areas of both canes, personal inspection by the writer has shown the P.O.J.-36 to be far superior in general appearance in the field, in tonnage of both cane and sugar per acre, in length of ratooning, in earliness of maturity and in tolerance of mosaic. The manager, Mr. Antonio Fraticelli, is thoroughly in accord with the author in this. The Rincón analyses show over a point less sugar in the juice of P.O.J. 105 in January than in that of the 36, while the "Los Caños" analyses show the P.O.J.-36 about two points in sugar and some five points in purity ahead of the 105. Finally, the Cambalache data show a superior purity by some  $3\frac{1}{2}$  points for P.O.J.-213 over P.O.J.-105. Why, then, is the so-called "Egyptian" cane so much more extensively cultivated in Porto Rico than any of the other three varieties here discussed in comparison? The answer is hard indeed to find except upon the grounds that the seed of the former was more easily obtainable when interest was first awakened in this class of cane at the time of the severe outbreak of mosaic disease on the West Coast and planters have learned to know this variety while seldom seeing the other—and manifestly superior—types. The author would strongly advise the substitution of this cane, wherever it is being grown, by the P.O.J.-36, pending the obtaining of more definite results in our substations from several others of the more promising and newer P.O.J. seedlings such as the 826, 979, 2714 and 2725.



## REFERENCES

- CROSS, W. E.—Informe Anual del Año 1917. Rev. Industrial y Agrícola de Tucumán, IX, 1, p. 14; 1918.  
ROSENFELD, ARTHUR H.—The Java P.O.J. Canes in Tucumán and Porto Rico. Jour. of the Dept. of Agriculture of Porto Rico, VIII, 3; July, 1924.

**Java 213—P.O.J.** See Plate XXIII, opposite page 209.

Cross of Chunnee with Cheribón (Black). Imported from the Argentine by this Station in January, 1921. Is doing very well indeed on a field scale at Bayaney and "Los Caños". This is one of the two canes which saved the Argentine sugar industry from complete destruction in the last decade and is being used as a parent at the Coimbatore Experiment Station in India. It is highly tolerant of mosaic and root disease and quite resistant to drought, although it is rather a slow germinator. It matures quite early in the season.

Recumbent. Stalk dark purple to wine color. Rind fissures in older joints, no growth fissures. Wax layer at first plain and thick, diminishing with age; glaucous band sharply defined. Internodes long, cylindrical, slightly concave on eye side and convex on opposite, slightly zigzag,  $\frac{3}{4}$ th to one inch in diameter. Pith smooth, often with a fistula, very hard rind. Growth ring horizontal, even, wide, 4-6 mms., yellow splashed with red. Root band cylindrical, more or less concave, broader than stalk, dark brown. Rudimentary roots in 2 rows. Furrow almost always absent, but distinguishable in older canes as a flattening. Bud elongated ovate with triangular point, small, broad margins, but very flat, germination apical, nervature converging to top. Leaf sheath about eleven inches long, with fissures one-half inch long. Ligule broad and even. Ligular process almost always absent, small and stumpy when present. Leaf blades narrow, about 4-5 cms., callus yellow-green, glaucous.

## REFERENCES

- FAWCETT, G. L.—Algunas Descripciones Botánicas de las Variedades de Java y Otras Cañas. Revista Industrial y Agrícola de Tucumán (Argentina), VI, pp. 509-23; May, 1916.  
JESWIET, J.—Beschrijving der Soorten van het Suikerriet. Java Arch., Med., VI, 12; 1917.

**P.O.J-213, Striped.**

Dr. Cross has kindly sent us a few seeds of this striped mutation of P.O.J.-213, which Mr. Fawcett has been breeding true to type for several years. Aside from color variation it appears to be

identical in other characteristics to the self-colored type, although comparative tests will be made.

\* Java 228-P.O.J. See Plate IV, opposite page 215.

Parents Chunnee X Black Cheribón. Imported from the Argentine by the Mayagüez Station in 1917. Somewhat distributed in western Porto Rico.

Erect, fairly vigorous, good stooling. Stalks slender, purplish with heavy bloom. Internodes long, cylindrical, straight, furrow scarcely evident. Nodes broad, prominent; growth ring broad, elevated, yellow then dark brown; root band pallid; rudimentary roots in 3 or 4 rows; leaf scar glabrous, appressed behind; glaucous band swollen, larger than internode. Buds ovate, broad, margin wide shouldered above, vestiture at base and apex. Leaf sheaths glabrate; throat lannate and with a sparse vestiture of hairs; collar inconspicuous, glaucous; ligule broad, fimbriate. Leaf blades erect, the tips declined, narrow, minutely but distinctly serrulate.

In the Santa Rita immunity tests and in the experimental plots at Mayagüez this kind showed less resistance to root disease and mosaic than 36-P.O.J., our experience in the Argentine being exactly similar. There seems no reason why it should be further cultivated.

#### REFERENCES

- ROSENFELD, ARTHUR H.—La Caña Java 228 (P.O.J.) *Rév. Ind. y Agr. de Tucumán*, III, 4, pp. 139-42; Sept., 1912.  
ROSENFELD, ARTHUR H., & BARBER, T. C.—Trabajos de las Sub-Estaciones, 1912-13. *Ibid*, IV, pp. 495-514; 1914.

\* Java 234-P.O.J. See Plate IV, opposite page 215.

Parents Chunnee X Black Cheribón. Introduced from the Argentine by the Mayagüez Station in 1917. Somewhat distributed on the west coast.

Erect or at length somewhat declined, very vigorous, heavy stooler. Stalks long, slender, usually less than 2½ cm., dull greenish with red flush. Internodes long, cylindrical or slightly larger below, straight, furrow scarcely evident. Nodes broad, enlarged; growth ring broad, yellowish, even; root band enlarged; rudimentary roots obscure, scarcely evident; leaf scar glabrous, narrow, appressed behind; glaucous band clearly marked, not constricted. Buds small, orbicular, becoming hemispheric, glabrous. Leaf sheaths glabrous; throat lannate and with scanty vestiture of hairs; collar inconspicuous, glaucous; ligule very broad, minutely fimbriate. Leaf blades spreading, numerous, narrow, hanging long on the stalk, slightly serrulate.



PLATE IV



P. O. J. 228



P. O. J. 234



P. O. J. 826



P. O. J. 972



P. O. J. 1228



P. O. J. 2379



P. O. J. 2725



Cayanna 10



Kavangire

This seems to be closely similar as plant to 36-P.O.J. in cultural characters and to be equally valuable as such though in the stubble crops it falls down badly in successive yields. It also is less tolerant of mosaic than 36. It cannot be strongly recommended for the districts that are completely invaded by mosaic P.O.J.-36 appearing to be very much more satisfactory from every standpoint but it should not be planted elsewhere for every stalk on the Island is infected, with the exception of the plats here at the Station and at Hatillo Fruit. While the disease does not injure the growth of P.O.J.-36, it would be an active center of infection if planted among healthy cane. Little analytical data is available (see P.O.J.-105).

## REFERENCES

- ROSENFELD, ARTHUR H.—The Most Promising Varieties of Sugar Cane Under Trial at the Tucumán Experiment Sta. *Int. Sug. Jour.*, 1914, pp. 12-23.  
*Idem.*—The Java P.O.J. Canes in Tucumán and Porto Rico. *Jour. Dept. Agr. of Porto Rico*, VIII, 3; July, 1924.

**P.O.J.-826.** See Plate IV, opposite page 215.

A cross of Chunnee with Cheribón in 1905. Obtained from Dr. E. W. Brandes, Senior Pathologist in Charge of the Office of Sugar Plant Investigations of the U. S. Bureau of Plant Industry in May, 1924. One of the thickest and finest looking of all of this series, with the most remarkably erect growth that the author has seen in any cane. In tonnage experiments at the Station and in substation at Bayaney, on typical hillside land of that section, at "Los Caños", on quite good *vega* land, and on the poor, shaly hillsides at the Hatillo Fruit Farm, it is showing up splendidly. No data are as yet available as to its sugar content, however.

Erect, fine vigor, arrows prolifically and early. Stalks long and fair girth, purple, heavy bloom. Internodes long, cylindrical, perpendicular to stalk, furrow broad and flat. Nodes prominent; growth ring broad and even, green to concolorous; root band wide, parallel, light yellow, then concolorous, heavy coating of wax; rudimentary roots conspicuous, few and scattered. 2-3 in row, greenish brown changing to concolorous; leaf scar glabrate, broad and prominent in front and appressed behind; glaucous band even and inconspicuous. Buds large  $10 \times 12$  mm., scarcely exceeding growth, ring, triangular-suborbicular, germination subapical, margins broad and flat, lannate, abruptly shouldered at base, light basal plaes. Leaf sheaths with abundant dorsal deciduous vestiture of tawny hairs, sides glabrate, tinted, slightly glaucous, inner base very slightly tinted with purple;



throat broad and well defined, lannate, long marginal tufts, collar medium width, reaching midrib, glaucous; ligule wide 4-6 mm.; fimbriate; ligular process on one side only, 2-4 cms. long, sometimes curved. Leaf blades erect with declining tips, narrow, 4-6 cms., dark green, margins minutely and uniformly serrulated, scanty basal ciliation.

## REFERENCES

- FAWCETT, G. L.—El Mosaico de la Caña de Azúcar. Rev. Ind. y Agr. de Tucumán, (Argta.) XIV, pp. 1-8; 1923.  
ROSENFELD, ARTHUR H.—Estudios de Variedades. Informe del Comisionado de Agr. de P. R., 1923-4, pp. 145-7.

P.O.J.-979. See Plate IV, opposite page 215.

Cross of Chunnee with Cheribón in 1905. Received through the courtesy of Dr. E. W. Brandes, Senior Pathologist in Charge of the Office of Sugar Plant Investigations of the Federal Bureau of Plant Industry in Washington, in May, 1924. After P.O.J.-826, this is about the best-looking cane of the canes of this cross in the Station tonnage plantings and in the substation at Bayaney, Los Caños and Hatillo Fruit Co. Farm.

Erect, fine vigor, arrows prolifically and early. Stalks long and rather slender, green with heavy purple flush, abundant bloom. Internodes long, almost cylindrical, slightly staggered, furrow broad and shallow to none. Nodes slightly elevated, oblique, growth ring narrow, even, concolorous; root band wide and well defined, oblique, covered with wax, concolorous; rudimentary roots small and rather inconspicuous, few and scattered, 2-4 in rows, brown; leaf scar glabrate, broad and prominent in front and appressed behind; glaucous band inconspicuous and almost even. Buds almost quadrangular, medium to large,  $10 \times 12$  mm., not exceeding growth ring, orbicular, germination subapical, margins wide almost square at top, covered with thick vestiture of closely appressed hairs, very heavy basal plaes. Leaf sheaths glabrate, no wax, light green; throat narrow and indistinct, lannate, with short marginal tufts; collar medium width and indistinct, reaching midrib; ligule wide, 4-6 mm., nearly even; ligular process on one side only. Leaf blades erect with declining tips, medium width, about 8 cms., dark green, margins serrated on upper two-thirds, sparsely ciliated at base.

## REFERENCES

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NELSON, HORACE.—Sugar Bull. of the Amer. Sugar Cane League. IV, 3, pp. 1-3; Nov., 1925.

**P.O.J.-1228.** See Plate IV, opposite page 215.

Produced in 1905 from seed of P.O.J.-160, which is a cross of Chunnee with Cheribón. Imported to the Station through kindness of Dr. Brandes, of the U. S. Bureau of Plant Industry. Cross in Argentina finds it not so vigorous as the other canes here discussed. It is cultivated in a very small extension in Java. It suffers some from mosaic disease and seems to run generally lower in sugar than the P.O.J.-36, 213 and 234, also maturing rather later. It does not seem to have much promise here, although results of tonnage experiments under way must be awaited before any definite opinion can be formed.

Erect and at length recumbent, fine vigor. Stalks long and slender (about diameter of P.O.J.-36) light brown base color, overlaid with heavy purple bloom. Internodes long, tendency to tumidity, slightly staggered, exceedingly broad, deep yellow furrow, flattening bud side of internode. Nodes elevated, oblique; growth ring wide, even with internode, yellowish green; root band wide, well defined, elevated, green with purplish waxy covering; rudimentary roots large, conspicuous and fairly numerous, 3-4 in rows, green; leaf sheath glabrate, narrow and appressed; glaucous band broad, even and inconspicuous. Buds medium size,  $8 \times 10$  mm., plump, not exceeding growth ring, broadly ovate, germination apical, margins flat, wide at shoulders, glabrate, short, inconspicuous apical tufts and basal plaes. Leaf sheaths glabrate, glaucous, green; throat medium width, lannate, with long marginal tufts; collar medium width, inconspicuous, reaching midrib, glaucous; ligule wide, 4-6 mm., nearly even; ligular process on one side only, 3-4 cms., apparently deciduous. Leaf blades spreading with declining tips, narrow, 4-5 mm., dark green, margins uniformly serrulated and ciliated.

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**P.O.J.-1499.**

Cross of P.O.J.-385 (Chunnee X P.O.J.-100) with P.O.J.-181 (Chunnee X Black Cheribón), which is very interesting parentage. Recently received from Dr. W. E. Cross, Director of the Agricultural Experiment Station in Tucumán, Argentina, where it has shown excellent agricultural yields, but low sucrose and high fiber. In Java in 1923 this variety constituted 36 per cent of the crop of the

Kedawoeng factory and from 5 to 10 per cent of the cane extension of several other plantations. It is a strikingly handsome cane of better average girth than most of the P.O.J. types and extremely erect.

Erect, good vigor, excellent stooler. Stalks long and of medium girth, dark green, with a slight purple flush, no bloom, characteristic discolored vertical striations. Internodes long, cylindrical, at right angle to stalk, furrow trace to short, broad flattening. Nodes bulging and parallel; growth ring medium width, about three to five mm., nearly even, light green to concolorous; root band wide and prominent, parallel, yellow to concolorous; rudimentary roots numerous but scattered, in rows two to four, purple, elevated, conspicuously large; leaf-scar slightly lannated with short hairs, appressed behind; glaucous band wide, tapering, indistinct. Buds medium to large, eight by ten mm., orbicular, never reaching growth-ring, germination sub-apical, appearance of being set in flattened cavity contrasting with bulging root band; margin narrow, flat, at shoulders only, not extending to apex, lannation along fibro-vascular bundles, no apical tuft and light basal places. Leaf sheaths sparsely lannated at back and more so at sides, glaucous, green; throat medium width, lannated with abundant short hairs, dark colored, tendency to split at sides; collar medium width, reaching midrib, glaucous; ligule medium width, three to five mm., widening at center, nearly even; ligular process long, wide and blunt, on one side only. Leaf blades spreading, medium width, about six cms., dark green with pronounced white midrib, uniformly serrulated to base, scanty basal ciliation.

**P.O.J.-2221.**

A cross of Kassoer and Cheribón. Obtained by the writer while in Washington in May, 1925, from Dr. E. W. Brandes, in charge of Sugar Plant Investigations for the Federal Bureau of Plant Industry. This parentage would give it one-fourth *Saccharum spontaneum* and three-fourths *S. officinarum* blood. Not sufficiently tested here as yet to enable us to judge anything of its qualities.

Reclining, good vigor, fine stooler. Stalks long and slender, green at first becoming light purple on exposure to light, heavy wax deposit. Internodes long, cylindrical, perpendicular to stalk, furrow none. Nodes slightly enlarged and parallel; growth ring medium width, 3 to 5 mm., even, green to concolorous; root band medium width, bulging, light green to brown, covered with white wax; rudimentary roots large, few and scattered, in rows two to three, purple; leaf scar glabrate, appressed behind; glaucous band wide, tapering, inconspicuous. Buds small to medium size, 5 by 7 mm., plump, sub-

orbicular, reaching growth-ring, germination sub-dorsal, margins wide and flat, on upper two-thirds only, becoming abruptly shouldered at sides, sparsely lannated, no apical tuft nor basal plaes. Leaf sheaths rather closely adhering, very sparsely lannated at back, sides glabrate, glaucous, green; throat narrow, gray, lannated with short appressed hairs, few straggling, coarse hairs at margin, collar narrow, dark gray, reaching midrib, lannated and heavily glaucous; ligule narrow at sides, 2 to 4 mm., becoming wider at center, no ligular process. Leaf blades spreading, narrow, 4 to 5 cms., dark green, prominent white midrib, margins minutely and closely serrulated and ciliated to base.

**P.O.J.-2379.** See Plate IV, opposite page 215.

A cross of Chunnee and Cheribón made in 1911. Obtained in May, 1924, from Dr. Brandes. It is about the poorest in general appearance of any of these canes in the tonnage experiments at the Station and in the substations of Bayaney, "Los Caños" and the Hatillo Fruit Co. Farm near the Station, at which latter point Mr. Dreier finds that it is less resistant to drought than the other P.O.J. canes. It is high in fiber and Cross, after two years experience with it in Tucumán, Argentina, finds it a late maturer, although giving fair agricultural yields. It is very little cultivated in Java and does not seem particularly promising for Porto Rico.

Erect, fine vigor. Stalks long and slender (about like P.O.J.-36) purple to brownish rose, heavy bloom. Internodes long, generally cylindrical, very slightly staggered, furrow broad and shallow. Nodes prominent, elevated; growth ring broad, even with internodes, yellowish green; root band wide, elevated and conspicuous, parallel, waxy coating, green with purplish tint; rudimentary roots rather numerous and conspicuous, 3-4 in rows, brownish; leaf scar glabrate, broad and prominent in front and appressed behind; glaucous band inconspicuous and generally even, covered with very short wooly hairs. Buds medium size,  $8 \times 10$  mm., not exceeding growth ring, broadly ovate, germination subapical, margins wide and flat, abruptly shouldered above with abundant vestiture of short tawny hairs, distinct apical tufts of short hairs, heavy basal plaes. Leaf sheaths with scanty deciduous dorsal basal vestiture, slightly glaucous, light green; throat narrow and indistinct, lannate, with long straggling hairs at margin; collar inconspicuous, broad, reaching midrib, glaucous; ligule exceptionally broad, 8-10 mm., fimbriate; ligular process long, on one side only, apparently deciduous. Leaf blades spreading with declining tips, medium width, about 6 cms., dark green, margins serrulated and sparsely ciliated on upper two-thirds.



## REFERENCES

See under P.O.J.-979.

## P.O.J.-2714.

A cross of E.K.-28 with P.O.J.-2364, which is very interesting parentage indeed. Received from Mr. G. L. Fawcett, Botanist of the Experiment Station in Tucumán, Argentina, in July, 1924. The amount of *Saccharum spontaneum* blood is only one-eighth, but it is readily recognizable. In Tucumán it has given good yields of both cane and sugar per acre and, like P.O.J.-2725, is almost immune to mosaic. One of the really promising canes for Porto Rico of this newer series of P.O.J. canes.

Erect, good vigor, fine stooler. Stalks long and of good girth, greenish-brown with heavy purple flush on exposure to sun, considerable bloom. Internodes long, cylindrical, perpendicular to stalk, furrow trace to narrow, short flattening. Nodes slightly enlarged and parallel; growth ring narrow, even in younger internodes, widening and becoming elevated when older, yellow-green to concolorous; root band wide, slightly bulging, light green to concolorous; rudimentary roots few, large and scattered, elevated, in rows 2 to 3, purplish; leaf scar glabrate and appressed behind; glaucous band narrow and inconspicuous, tapering. Buds medium size, 7 by 9 mm., ovate, reaching growth-ring, germination sub-apical, margins narrow and triangular, sparsely lannated, long, heavy apical tuft and light basal plaes, some lannation along fibro-vascular bundles. Leaf sheaths heavily lannated at back, course tawny hairs, side glabrate, green; throat wide, dark lannated with short appressed hairs and a few straggling hairs at sides; collar broad, glaucous, brownish; ligule narrow at sides, 2 to 4 mm., becoming wider at center, nearly even, short, stubby ligular process, situated unusually low on throat, on one side only. Leaf blades spreading, very wide, about like P.O.J.-2725, dark green, not flat, minutely and uniformly serrulated and ciliated to base.

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- CROSS, W. E.—Some notes on Cane Variety Work in Tucumán. Int. Sug. Jour., April, 1925, p. 204.
- P.O.J.-2725. See Plate IV, opposite page 215.

A cross of E.K.-28 with P.O.J.-2364, which means that this cane, distinct from the Chunnee and Cheribón crosses has only one-eighth *Saccharum spontaneum* blood, which is shown by its appearance,



which is not all of the classic P.O.J. type, it being a fine-looking, thick cane resembling the noble canes in type. Obtained in 1924 from the Mayagüez Experiment Station, where it in turn was obtained from the Agricultural Experiment Station in Tucumán, Argentina, where it has given some very promising results and is beginning to be cultivated on a commercial scale. It is one of the few thick canes that resist taking mosaic diseases almost to the point of immunity, not over one-tenth of 1 per cent of infection being found even where it is surrounded by varieties 100 per cent infected. Two thousand two hundred hectares of this variety were cultivated in Java in 1922. Cross reports good sugar content in Argentina and states that of the practically immune canes in Tucumán, this has given consistently the best results of all, and that he considers it the most promising of all the newer varieties in that province. It flowers early and abundantly.

Erect, at length recumbent, fine vigor, good stooler; arrows early and profusely. Stalks long and medium girth, yellowish green to dark green with bronze flush on exposure to sun, no bloom. Internodes medium to long, cylindrical, slightly appressed at sides, slightly staggered; furrow narrow and deep, extending over half of internodes. Nodes slightly constricted and oblique; growth ring broad, even or sometimes slightly sunken, light green to concolorous; root band oblique, medium width, concolorous; rudimentary roots few, large, 2-3 in rows, purplish to concolorous, inconspicuous; leaf scar glabrate, appressed behind and prominent in front; glaucous band narrow, slightly constricted, conspicuous. Buds medium size, exceeding growth ring by one-third, oval to ovate, germination sub-apical, margins narrow, flat, on upper half only, lannate with short hairs, abruptly shouldered at sides giving bud an urn shape, short apical tufts, light basal plaes. Leaf sheaths green inside and out, glaucous, heavily lannated at back, sides glabrate; throat broad and dark, covered with short appressed hairs, straggling hairs at margins; collar wide, reaching midrib, glaucous; ligule narrow at sides, becoming broad and peaked at center, lannated, no ligular process. Leaf blades spreading with declining tips, very broad, dark green, white midrib, margins uniformly serrated and with scanty ciliation at base.

Two serious defects of this variety are its early and prolific flowering habit and its extremely spiny leaf-sheath.

Mr. Robert L. Davis, Associate Agronomist of the Mayagüez Station wrote the author on 11th December, 1925:

"You would be interested in the planting I made on Las Mesas last Janu-

ary. The P.O.J.-2725 has made a growth up there superior to that of B.H.-10/12 or St. Croix-12/4. The soil is a porous red clay, very low in fertility."

Seen in some of Mr. Matz' plantings at Fortuna, it was making a splendid development under South-Coast conditions. It grew remarkably well on poor red clay soil at the Station when first planted here and is looking well in tonnage experiments and hillside plantings, while in the "Los Caños" and Hatillo Fruit Co. substations, the one on splendid *vega* land and the other on poor, porous red hill land of low fertility, it is showing up well. At the Bayaney substation, under hillside conditions and planted under very trying conditions as regarded moisture in the soil to the point of its being practically planted in the mud, it is not showing up so well as some of the P.O.J. varieties. At the Demonstration Farm of the Department of Agriculture near Arecibo, it has made excellent development and proven almost immune to mosaic while from Mayagüez Mr. J. A. Saldaña reported to the writer a yield of 49.9 tons per acre from a small field planted with only one three-eye seed piece in holes five feet apart. This cane was 13½ months old when cut.

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- CROSS, W. E.—Experiencias con Variedades Nuevas de Cañas. *Ibid*, XIV, pp. 107-8; 1923.

Tjep.-24.

Cross of Cheribón with Kassoer, containing, therefore, one-fourth *Saccharum spontaneum* and three-fourths *S. officinarum* blood, which is promising parentage. In Argentina, under generally 100-per-cent mosaic-infection conditions, this variety has never shown the disease and has given cane of satisfactory sugar content, although rather low field yields. It is an unattractive looking cane with its always prematurely sprouted roots.

Erect to recumbent, splendid vigor, good stooler. Stalks long and thin purple, covered with heavy grayish black wax deposit. Internodes short, cylindrical, or slightly appressed at sides, perpendicular to stalks, furrow none. Nodes slightly elevated, parallel; growth-ring broad, 4 to 6 mm., slightly elevated, but very inconspicuous, yellowish-green to concolorous; root-band wide, slightly elevated, yellowish-green to concolorous; rudimentary roots large, few and scattered, 2 to 3 in rows, purple, decided tendency to premature sprouting; leaf scar glabrate, appressed behind; glaucous band

nearly even, inconspicuous. Buds small, 5 by 7 mm., sub-orbicular, reaching growth-ring, germination sub-apical, margin wide and flat, nearly glabrate, on upper half only, no apical tuft nor basal places. Leaf sheaths sparsely lannated at back, sides glabrate, slightly glaucous, no tinting; throat wide at sides, sharply narrowing to center, lannated with short, tawny hairs, brownish; collar shaped as throat, brownish, lannated with short wooly hairs; ligule narrow at sides, becoming abruptly enlarged and peaked at center; ligular process on one side only, very long and pointed, as long as two inches. Leaf blades spreading, narrow, 4 to 5 cms., dark green, minutely and uniformly serrulated to base, scanty basal ciliation.

## REFERENCES

See under P.O.J.-2714.

**Kakoo.**

Listed as for sale by Dr. Stahl. "Revista", 1887, page 174. Probably introduced from Jamaica, where this variety was grown. Not since reported.

**Lahaina.**

(Lajaína.) Given by Dr. Stahl. *Revista*, 1887, page 174, as a synonym for Borbón, which he always considered as distinct from Otaheite or Caña Blanca.

**Lahaina Striped.**

The records show that a cane was cultivated at this Station under this name in 1913. There is no indication as to its origin. The description on file reads much like the striped form of Bambú.

**Light Stripe.**

A cane under this name reported on in Circular 8 of this Station where yields for three cuttings and average analyses are given. The origin of this cane cannot be traced and no description is on record. It was probably Calaneana, but this opinion is based on the probabilities and not on evidence. Possibly it was only Rayada.

**Louisiana Purple.**

See Morada.

**L-511.**

Seedling of T-189. Imported from Louisiana by Central Guánica in October, 1920, and part of the seed was sent to this Station where it made a satisfactory early growth, but has the unfortunate characteristic of stopping development at seven or eight months. This is the only one of the Louisiana seedling so far imported. It is supposed to be an even better early cane than D-74, but results both

here at the Station and on the Hatillo Fruit Farm have been anything but satisfactory and the cane gives little promise of success here. It was by the far poorest developed of twelve varieties seen on the hill-side *finca* of Don Paco Solá near Caguas on 9th October, 1924.

The following letter from Mr. T. D. Boyd, Assistant General Superintendent at Guánica Central in 1921, in which he quotes a letter from Mr. W. G. Taggart, Assistant Director of the Louisiana Sugar Experiment Station in Audubon Park, New Orleans, gives some interesting information as to the description of this cane under mosaic conditions:

SOUTH PORTO RICO SUGAR CO. OF PORTO RICO  
ENSENADA, PORTO RICO

OCTOBER 7TH, 1921.

MR. E. D. COLÓN,

*Director, Insular Experiment Station,*

Río Piedras, P. R.

DEAR SIR:

I have a letter from Mr. W. G. Taggart, Assistant Director of the Sugar Experiment Station at Audubon Park, New Orleans, dated September the 27th, as follows:

"In reply to your letter of September 1, I am inclined to believe that you have gone into a problem which we have been studying for the last few years. The cane known as L-511 as grown on Oak Lawn plantation was grown from one stalk carried there by Mr. Chiquelin in 1912, and we find it, when grown at the Station, to be somewhat different from our L-511. I am enclosing you a comparative description of the two canes and hope that from it you can distinguish the L-511.

"We are not sure whether Oak Lawn has gotten some other cane confused with L-511 or whether the one stalk which was originally carried there varied slightly from the rest that we kept. At any rate, the Oak Lawn cane has continued to yield a very rich juice, and with the exception that it is not very resistant to mosaic, it is a valuable cane to us. My personal opinion is that the difference is due to the conditions under which the two canes have been grown and the possible effect of the mosaic disease on the L-511 here. In fact, I can see a closer resemblance in the cane that has been growing under mosaic conditions for two years to L-511, than the Oak Lawn cane which has been growing under mosaic conditions for one year."

#### COMPARATIVE DESCRIPTION OF L-511.

Oak Lawn Cane	Station Cane
	<i>Growth</i>
Tall and upright	Medium height and upright
	<i>Top</i>
Short and tapering	Very short and tapering

*Foliage*

Medium width, long and well curved      Broad, long and well curved, younger than Oak Lawn cane

*Leaf Sheath*

Light yellow green; free from hair      Light yellow green, but green more mottled; some hair

*Node*

Smooth; rootlets round      Slightly raised, inclined to grow

*Eyes*

Round      Elongated

*Color of Cane*

Yellow      Yellow

*Effect of Mosaic*

None on color      Narrow purple stripes

I hope that this information will enable you to distinguish the two forms of the same variety as suggested by Mr. Taggart.

Very truly yours,

(Signed) T. D. BOYD,  
General Superintendent.

A comparative analysis of L 511 and Cristalina as 16-month-old first ratoons at the Station, made on 31st March, 1923, follow:

Variety	Extraction	Brix.	Sucrose	Glucose	Purity
L-511 .....	54.15	22.75	20.98	0.207	92.00
Cristalina .....	55.50	20.80	19.92	0.540	95.77

## REFERENCES

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DODSON, W. R.—27th Annu. Rept. La. Agr. Expt. Stations, 1914. In Rept. of the Sugar Experiment Station, by W. G. Taggart, p. 20.

Lousier.

Stahl, page 136. This is usually supposed to be Otaheite, but here it seems to be used in a different sense. No description is given so it can not be traced. At Central Coloso it is used as a synonym for Penang. Probably Stahl's Lousier is Cavengerie, as the Lousier of Mauritius is this cane, as seen by the author when imported from that island to Brazil.



**Malabarde.**

Stahl, *Revista*, 1887, page 174. López Tuero, page 10. Given as = Morada, but it is listed with the striped canes. Probably as used should be taken to = Rayada. This name cannot be traced in the literature. Malabar often occurs and usually = Yellow Caledonia.

**Morada.**

(= Louisiana Purple, = Black Cheribón.) Probably introduced in the early days of the nineteenth century, mixed with Otaheite. It occurs frequently in mixed plantings in all parts of the Island, but is nowhere grown in pure cultures. There seems no reason other than chance why this cane has been neglected in Porto Rico while the two other Cheribón canes, Cristalina and Rayada, are the two kinds most widely planted. It differs from them only in color, being a uniform dark purple with heavy bloom. It is equally well adapted to a wide range of cultural conditions. In a field planted at this Station in November, 1920, where there are a number of selections of Cheribón canes from different sources, this made rather the best growth and stooled rather more heavily than any of them. It is a good standard variety that has been completely overlooked here. For years it has been one of the principal canes of Louisiana. No data is at hand to show whether or not its supposed earlier maturity holds good here.

## REFERENCES

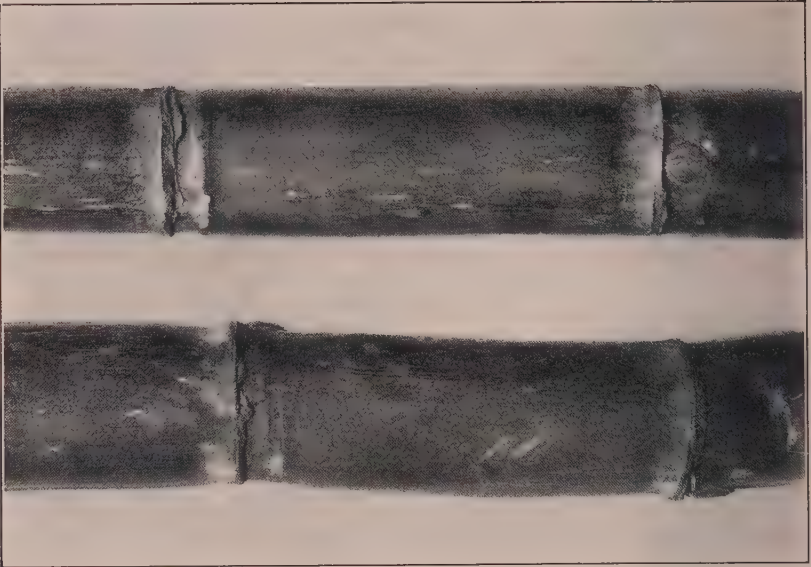
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\* **Otaheite.** See Plate XXIV, opposite page 227.

(= Caña Blanca = Bourbon = Lahaina.) Introduced from the other West Indies, perhaps from Cuba, in the early days of the nineteenth century. It quickly replaced the Creole and for seventy-five years was the only cane planted commercially. On account of the epidemic of 1872 its planting has been largely abandoned. It was still the only cane planted at Central San Francisco at Guayanilla on the south coast until the outbreak of gumming disease there in 1922 and it occurs rather widely in mixed and sometimes in nearly pure plantings in many other parts of the Island, especially in the hill country of the central and eastern districts.

Erect but soon procumbent, vigorous on suitable soils, medium stooler, arrows frequently. Stalks long, medium stout, bright green,





OTAHEITE



G. C. 493

yellow at maturity, sometimes faintly tinted when fully exposed but without a distinct flush, bloom scanty or none. Internodes long, sub-cylindrical but inclining to barrel shape, straight or a little staggered, furrow evident but poorly developed. Nodes somewhat constricted; growth ring rather narrow, even or slightly sunken, concolorous or pale brownish; root band narrow, 5 to 8 mm., concolorous; rudimentary roots distant, white, then brownish, not conspicuous, in about 3 rows; leaf scar perpendicular to stalk, glabrous, appressed behind; glaucous band clearly marked, usually constricted, narrow, 7 to 10 mm. Buds small, flat, often reddish when exposed, elliptic-ovate, acute, exceeding the growth ring by one-fourth of length, base rounded, margin narrow, 1 mm. or less, uniform, germination apical, places of short crisped hairs at base, margin and apex with conspicuous, appressed long hairs. Leaf sheaths with dense vestiture of pallid, sub-appressed, acicular hairs, greenish, somewhat glaucous; throat brown, lannate with scanty tufts of long soft hairs at the margins; collar brown well marked, not reaching the midrib, sparingly lannate, especially toward the margins; ligule medium width, tapering from about 4 mm. in center to 1 mm. at ends, margin even, ligular processes well developed, unequal, one usually 14 to 18 by 6 to 7 mm., slender but obtuse, the other broader and shorter. Leaf blade suberect, flat, long and rather narrow, about 6 cm., bright but rather light green, minutely but closely serrulate, even or with scattered cilia at base.

This has been a grand cane, but unfortunately it is adapted to a narrow range of conditions, and these have ceased to exist in most cane-growing countries. That it had not deteriorated was shown by its behavior at the Central San Francisco where on rich, porous, alluvial lands, the soil conditions for which it is fitted, it was still giving highly satisfactory results up to five years ago. It is reputed to be the same cane as the Lahaina of Hawaii and the Bourbon of the British West Indies. Whether this is really the case can only be determined by further comparative studies, for which material has not been available. The buds illustrated by Fawcett as those of Lahaina (Rev. Agri. Tucumán, 10; 139, 1919) are too broad to be typical for Otaheite. Here it is heavily mixed with the similar but clearly distinct cane described on another page as Penang, though its right to that name is very doubtful. The native field men distinguish the two kinds readily and never confuse them, always calling the Otaheite "Caña Blanca" and often calling the other Borbón. Both Dr. Stahl and López Tuero considered Otaheite and Borbón as distinct, but they also recognized Penang as being a third kind.

Otaheite is and always has been a poor ratooner. The present practice on the south coast of ratooning but little or not at all comes largely from the fact that till recently Otaheite was the only cane planted there. It deteriorates quickly in the field after reaching maturity and cannot be safely left over for *caña quedada* or long crop. It has always been considered here as an early maturing cane, although in Peru and Hawaii it is harvested up to 24 months old and seldom at less than 20, and as being the standard of excellence in sweetness and milling qualities. These claims are not well supported by the analyses in our files. As will be seen below, in every single case where direct comparison is possible with Cristalina from the same field the latter has proven the better, and more conspicuously so early in the season than at full maturity. The highest record we have is about equal to the best recorded from Cristalina. It is hard to understand why all the early planters so greatly preferred it to the latter kind:

Kind	Date	Age	Extr.	Brix	Sucr.	Red sug.	Purity	Fiber
Otaheite .....	1-5-21	15 mo. ....	66.6	14.25	10.69	2.18	74.96	18.96
Cristalina .....	1-5-21	15 mo. ....	66.6	16.90	15.35	0.56	90.56	11.35
Otaheite .....	12-20-20	15 mo. Rat. ....	73.0	17.0	14.46	0.39	85.5	18.50
Cristalina .....	12-20-20	15 mo. Rat. ....	70.0	17.50	15.53	0.28	88.74	9.60
Otaheite .....	1-29-21	15 mo. Rat. ....	71.1	15.85	12.66	1.56	79.87	18.87
Cristalina .....	1-29-21	15 mo. Rat. ....	70.3	17.85	16.14	0.33	90.42	10.69
Otaheite .....	1915	Plant. ....	.....	17.13	15.40	.....	81.6	.....
Cristalina .....	1915	Plant. ....	.....	17.98	16.55	.....	92.0	.....
Otaheite .....	May 1916	Ratoons .....	.....	18.3	17.0	.....	92.89	.....
Cristalina .....	May 1916	Ratoons .....	.....	18.8	17.8	.....	94.14	.....
Otaheite .....	Apr., 1917	Pl. 14 mo. ....	.....	21.3	20.10	.....	94.30	.....

This last is our highest record for Otaheite; no comparable analysis for Cristalina was recorded, but it is clear from the above that before reaching full maturity Cristalina is the sweeter cane, a fact that will come as a surprise to most growers. In tonnage Otaheite is likely to lead Cristalina as plant cane on well-drained alluvial soils, but the reverse will be the case for most other locations and always for ratoons.

It is perhaps useless to have spent so much time discussing this interesting old variety, since its doom is now sealed. It is being definitely discarded in its last stronghold among the hills because it is so heavily infected by gum disease in practically all of that region. It seems to be the most susceptible of all canes to this very serious trouble, although Penang and Bambú are probably in the same class. Rayada and Cristalina are also attacked by it but suffer much less seriously, while Yellow Caledonia, Cavangerie and D-109 seem to be practically immune. Otaheite is also extremely susceptible to root disease in all of its forms, to the vascular bundle fungus, and to



mosaic. Its susceptibility to all of these serious troubles is so great that it should be ruthlessly exterminated.

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**Palo Rojo.**

See Bois Rouge.

**Palo Rojo Claro.**

See Bois Rouge Blonde.

\* **Penang.**

This name, as used here, applies to Porto Rico only. Penang is usually considered as = (Salangore, but this is quite distinct.) Introduced by Dr. Grivot Grand-Court prior to 1879, probably from Guadalupe. It was still planted in pure cultures at Central Coloso, a few years ago, where it was also known as Lousier. Frequently occurring in mixed plantings in all parts of the Island. It has been brought to the Station from Bayaney under the name of Borbón. More likely to be confused with Bambú than with Otaheite by most planters.

Erect, often soon procumbent, good average vigor, good stooler, arrows frequently. Stalks medium diameter, light green, not yellowish, no flush, little or no bloom. Internodes rather long, cylindrical, straight, furrow shallow, poorly defined. Nodes slightly constricted; growth ring broad, 2 to 5 mm., swollen, concolorous; root band narrow, 6 to 10 mm., concolorous, rudimentary roots few, distant, large, whitish with purple centers, in about 3 rows; leaf scar perpendicular, glabrous, appressed, behind; glaucous band narrow, well defined. Buds triangular-ovate, obtuse, 9 to 10 by 9 to 10 mm., often only reaching and never exceeding the growth ring, margin  $1\frac{1}{2}$  to 2 mm., flat, slightly wider below, germination subapical, greenish or purplish, nearly glabrous. Leaf sheaths with medium vestiture of short pallid subappressed hairs, glaucous, with a conspicuous lilac tinge, throat pale brown, minutely and sparingly lannate, with conspicuous tufts of marginal hairs; collar pale brown glaucous, sparingly lannate, toward the margins; ligule narrow, 1 to 3 mm., tapering toward the margins, edge even; ligular processes none. Leaf blades long, spreading, medium width, about 6 cm., dark green, minutely serrulate.

No conjecture can be made as to the true name of this cane.

If it is the Lousier of Mauritius, which seems possible from its history, then that cane is abundantly distinct from Otaheite. It has been so long associated with the name Penang in this Island that that name is provisionally retained for it. It is evidently better adapted to old, compact lands than the Otaheite and it is a better ratooner. According to notes left by Mr. Crawley, the former Director, this was the principal kind planted at Central Coloso in 1913 and its planting was then being extended at other points on the west coast. It was highly recommended by Dr. Stahl, who considered it immune to the epidemic of 1872. Its planting is now abandoned at Coloso on account of its susceptibility to mosaic. Our notes indicate that it is heavily attacked by gum disease, but in this there may have been confusion with Bambú, the two having only recently been clearly distinguished. In an experimental planting of many varieties made in November, 1920, this kind took a high place for germination, stooling and general vigor.

The following analyses are available:

Kind	Date	Age	Arr.	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
Penang.....	2-9-21	Pla. 16 mo..	No..	68.7	16.00	13.11	1.76	81.93	11.62
Cristalina.....	2-9-21	Pla. 16 mo..	No..	68.7	16.20	13.85	.95	85.49	11.20
Penang.....	3-3-21	Pla. 17 mo..	No..	71.4	14.85	16.35	.87	88.61	11.44
Rayada.....	3-3-21	Pla. 17 mo..	No..	72.7	18.25	16.30	.71	89.31	12.00
Penang.....	3-11-21	Pla. 17 mo..	No..	70.5	19.95	17.74	1.64	88.92	11.80
Penang.....	5-4-21	Pla. 18 mo..	No..	61.3	19.70	17.85	.75	90.60	.....
Cristalina.....	5-4-21	Pla. 18 mo..	No..	65.1	19.55	18.93	.241	96.82	.....
Penang.....	5-5-21	Pla. 18 mo..	No..	67.3	20.60	18.83	.791	91.47	.....

This indicates a cane of very satisfactory quality but a little later in maturing than Cristalina. In recent tonnage experiments at the Station it has shown up distressingly poorly and seems hardly worthy of anything more than historical further attention.

**Pesante.** See Plate —, opposite page —.

A local name at Mayagüez for Java 105-P.O.J., or "Egyptian", from the name of the "Colono" on whose place it first attracted attention in that locality.

#### THE PORTO RICO SEEDLING CANES

Besides the canes bred at the Mayagüez and Río Piedras Stations, the former of which up to number 200 bore the letters "P.R." and the latter of which begin with 201, seedling canes have been bred at Fajardo, Fortuna and Guánica Centrals. No Fortuna seedlings remain as such, but the Fajardo seedlings are designated with the letters "F.C." and the Guánica seedlings as "G.C." The production of seedlings at the Mayagüez Federal Experiment Station was

resumed about 1917 and the seedlings produced since then have been known by the letters "M.P.R." Of the old original P.R. canes, which were bred at Mayagüez from 1906 to 1911, all seem to have been lost. One of them, P.R.-68, turned up in the first Santa Rita immunity experiment, where it made a very poor record and has not been heard of since.

Sixteen of the three hundred and twenty or more kinds produced at this Station during 1912 have been selected and kept in continuous cultivation here since that time, and some of them have been considerably disseminated throughout the Island. They were described, by Earle and are discussed in the following pages. A few of these are good canes. It is probable that each of five or six of them under conditions favorable to it will produce greater tonnage and rather more sugar per acre than *Cristalina* and *Rayada*. It cannot be claimed, however, that any of them are of surpassing merit. They will average about like the best of the Barbados and Demerara canes that have been tested here. Among the large number of seedlings produced by Cowgill each year from 1913 to 1918 there are a number that are promising. Those from 1916 on have not been fully tested and have not been disseminated. They will not be discussed at this time. No seedlings were produced at this Station from 1918 to 1925, as facilities were hardly sufficient for the proper testing of those already in hand, but, with this testing well in hand in the fall of 1925, the writer through the kindly interest and efficient cooperation of Commissioner of Agriculture Carlos E. Chardón, was enabled to complete arrangements for beginning the seedling work again, with Mr. J. A. Saldaña, formerly of the Federal Station at Mayagüez, in charge of the work under the immediate supervision of the writer. The work was well and carefully planned in advance and all breeding was done with known parents, using such valuable material as BH-10(12), SC 12/4, D-117, D-109, D-74, Uba, CH 64/21, Kassoer, P.O.J.-36, 36 (M), 213, 228, 234, 826, 979, 1228, 2379 and 2725, PR-260, 328, 358, 460, etc., etc. Some ten thousand seedlings were obtained and are planted out not only at the Station, but at seedling substations on the Island. To the great regret of all associated with this splendid and painstaking young plant breeder, Mr. Saldaña passed away in June, 1926, after having seen hundreds of the seedlings produced by him starting off to a wonderful growth. He left remarkably clear and detailed notes, which will enable us to carry on the work he started with a full knowledge of all original details. The writer has never seen a large planting of new seedling make such excellent average growth in the field as have these of Mr. Saldaña's and future

varietal workers at the Insular Station are going to have some very interesting and abundant material with which to carry on their labors.

#### THE FAJARDO SEEDLINGS

A very considerable number of seedling canes have been and are still being propagated and tested by the Central Fajardo. They are numbered under the initials "F.C." Some of them are now being extended there on a large scale. Sixty of them were included in the immunity test at Santa Rita. A number of these proved strongly resistant to both root disease and mosaic. They have none of them been disseminated over the Island and only three are in cultivation at this Station.

##### F.C. 140.

A seedling of D 433 (Ceniza de Fajardo), which parentage it shows clearly in its general appearance and in its susceptibility to the *Helminthosporium sacchari* leaf spot. Obtained by Director Francisco López Domínguez from Mr. Rafael A. Veve, in charge of the Fajardo Experiment Station, where this cane was bred, in spring of 1925. In Fajardo it has a good record and is starting off well at the Station. Will be planted out to tonnage experiments this fall.

Erect, then recumbent, good vigor and stooler. Stalks long, good girth, green at first, changing through purple to red as cane becomes older and finally as very old cane becoming a brilliant lemon yellow, heavy wax covering. Internodes long, appressed at sides, enlarged at base opposite bud, staggered, no furrow. Nodes constricted and oblique; growth ring oblique, narrow in front, 2 to 4 mm., widening in back opposite bud, nearly even, green to concolorous; root-band wide, oblique, covered with heavy wax deposit; rudimentary roots numerous and crowded, small and inconspicuous, in rows 5 to 6, light purplish; leaf scar glabrate and appressed behind; glaucous band narrow, constricted, inconspicuous. Buds medium size, 7 by 9 mm., orbicular, reaching growth ring, germination dorsal, margins wide, flat and alate, nearly glabrous, light basal place. Leaf sheaths with heavy vestiture of short tawny hairs at back and sides, lightly tinted within and out; throat wide, dark, lannate with short wooly hairs, some long coarse hairs at margins, tendency to split at sides; collar wide, reaching midrib, glaucous; ligule narrow at sides, 2 to 4 mm. and wider at center, even. Ligular process none. Leaf blades erect with declining tips, broad, about 8 cms., dark green, very susceptible to *Helminthosporium sacchari* leaf-spot, minutely and uniformly serrulated at margins, abundant basal ciliation.



**F.C.-214.** See Plate III, opposite page 191.

Seedling of *D. 433*. Received through courtesy of Mr. R. A. Veve, in charge of Experimental Work at Fajardo Central.

Erect, at length recumbent, good vigor, fair stooler. Stalks long and medium girth, ranging from greenish yellow through rose to light purple, heavy bloom. Internodes medium length, cylindrical, slightly staggered, no furrow; nodes slightly elevated in front, even behind; growth ring narrow and inconspicuous; root band wide, oblique, bright green, covered with heavy wax deposit; rudimentary roots crowded, inconspicuous, 4 to 7 in rows, concolorous; leaf scar glabrous, appressed behind; glaucous band constricted and broad. Buds orbicular and plump, medium size,  $10 \times 12$  mm., scarcely exceeding growth ring, germination subapical, margins wide, flat and glabrate, conspicuously shouldered above, purple. Leaf sheaths lanate, sides glabrate, slightly glaucous, green; throat wide, lanate, long coarse hairs at margins; collar wide, well defined, reaching midrib, dark gray and glaucous; ligule narrow, nearly even; ligular processes none. Leaf blades spreading with declining tips, broad, 10-12 cms., dark green, margins serrated.

As is characteristic of practically all seedlings of D-433 parentage, this cane suffers very severely from the leaf spot, *Helminthosporium sacchari*, although possibly less than its sister *F.C.-306*. At the Station it has seemed to ratoon better than *F.C.-306* and Mr. Veve corroborates this fact in a letter to Mr. Menéndez Ramos, former Director of this Station. It is also susceptible to gomosis. Mr. Harold Stiles wrote us from Manatí, under date of 19th December, 1924, that this variety was doing nicely for him. Mr. P. Richardson Kuntz, wrote us from San Antonio de los Baños, in Havana Province, Cuba, on 30th May, 1925:

"Of the Fajardo seedlings F.C.-214 is the best; although it is not so well development as the F.C.-137 it has stoolled better and forms a better-looking stool."

#### REFERENCES

- ROSENFELD, ARTHUR H.—List of All Sugar-Cane Varieties under Trial at the Insular Station, 30th June, 1924. 14th. Ann. Rept. of the Insular Station of Porto Rico, 1923-24, pp. 63-4.  
VEVE, R. A.—Reports of the Fajardo Experiment Station, 1923-26.

**F.C. 306.** See Plate III, opposite page 191.

Seedling of D-433(f) and D-109(m). Received through courtesy of Mr. R. A. Veve, in charge of Experimental Work at Fajardo Central.



Erect, at length recumbent, good vigor, Stalks long and medium girth, yellowish red to brownish red with irregular discolored patches, light bloom. Internodes medium length, slightly tumid, slightly staggered, furrow slight to none; nodes constricted at back only; growth ring broad and slightly elevated, concolorous; root band medium width, oblique, yellowish to dark green, some waxy covering rudimentary roots inconspicuous, few and scattered, 3-4 in rows, purplish; leaf scar glabrate, broad and prominent in front and appressed behind; glaucous band constricted, broad and well defined. Buds suborbicular, medium size,  $10 \times 12$  mm., scarcely exceeding growth ring, germination subapical, margins wide and flat, sparsely lannate, heavy basal placs, purplish at tips. Leaf sheaths with deciduous dorsal vestiture, sides glabrate, heavily tinted, glaucous, inner base lightly stained with purple; throat wide, lannate and well defined; collar medium width, reaching midrib, lannate; ligule narrow, 2-4 mm., nearly even; ligular process short and on one side only. Leaf blades spreading with declined tips, medium width, 8-10 cms., dark green, upper margins minutely serrulated, bases ciliate.

This variety has given splendid cultural and industrial results at Fajardo, where it has replaced their standard D-433 (Ceniza) on several hundred acres and is being rapidly extended. The writer has seen some exceptionally fine fields of this variety at Fajardo. At the Station and in other parts of the Island it has not seemed at home and, even at Fajardo, it suffers very severely indeed from the leaf spot, *Helminthosporium sacchari*, and is susceptible to gomosis, also. It ratoons fairly well where there is abundant moisture. While results under the peculiar condition of Fajardo amply justify its extension on the northeast corner of the Island, it does not seem particularly promissing for the remainder of the cane area.

#### REFERENCES

- COOK, MELVILLE T.—*Helminthosporium* Leaf Spot of Sugar Cane in Porto Rico. Journ. of the Dept. of Agr. of P. R., VIII, 4, pp. 1-10; Oct., 1924.  
VEVE, R. A.—Reports of the Fajardo Experiment Station, 1923-26.

#### F.C.-306 Striped.

Mr. Luis Serrano has selected out and bred true to type a pretty striped sport of this variety which in everything but color seems identical to the self-colored type. It would be advisable to make tonnage tests of this variety in comparison with the normal type in order to determine if its composition has changed any, or its resistance to leaf-spot, along with the change in color, the which, while not probable, is possible.

## THE FORTUNA SEEDLINGS

At one time seedling canes were grown at Central Fortuna near Ponce, which is now one of the Guánica properties. This work was soon discontinued and most of the seedlings have been lost. Only one was included in the immunity experiment at Santa Rita, where it made a very good record in resistance to both root disease and mosaic.

Not seen elsewhere.

## THE GUÁNICA SEEDLINGS

The growing of seedling canes was begun at Central Guánica about 1908, but has been discontinued. They are numbered under the initials "G.C." These numbers reached nearly two thousand. Numbers 493, 701, 888 and some others are now grown on a large scale on the various Guánica properties. Two of the "G.C." varieties are in cultivation at Fajardo and three are in the collections at this Station. They have not been otherwise disseminated.

\* **G.C.-493.** See Plate XXIV, page 227.

A seedling of Otaheite produced in 1908. Brought to the Station from Guánica by Mr. Earle in 1921. Murphey reported very well on it from Guánica from 1908 to 1913, finding it a vigorous stooler, superior looking in general to Otaheite and of higher sucrose content than its famous parent. In 1912 he reported a sucrose content of 14.5 per cent for it in January and a production of 38.3 tons per acre, calling it at the same time a "fine ratooner". He stated that it has around 50 per cent more stalks per stool than the native kinds.

Habit declined, vigorous. Stalks heavy, yellowish-green. Internodes long, cylindrical, straight; furrow none or scarcely evident. Nodes broad, not constricted; root-band broad; rudimentary roots brownish, in about 3 rows; growth ring broad, elevated; leaf scar glabrous, not prominent, appressed behind; glaucous band broad, but poorly defined. Buds sub-hemispheric, reddish, margins broad, equal, base, margin and apex ciliate. Leaf sheaths glabrate; throat minutely lannate, vestiture reduced to a few short hairs; shoulders with short lobes; ligule narrow, even; collar minutely lannate. Leaf blades declined, narrow, minutely serrulate above, even below.

In 1913 Murphey noted that this cane is of full size right to the top and could "all be utilized". Todd the same year mentioned it as promising at Guánica. Bourne in June of that year reported that it was resisting drought better than Otaheite or B-208, also that it flowered in Santa Rita. It is also said to stand the attacks of

white grubs much better than the native varieties and to need a longer period than these for thorough ripening, particularly under moist conditions (Bourne). In May, 1914, it was reported from Guánica as doing well in all places tried, both as *Gran Cultura* and as *Primavera*.

At the Station it has proven highly susceptible to mosaic disease and, while the first plantings were very vigorous, it is not at present showing up so promisingly in tonnage experiments in comparison with B.H.-10(12).

We have the following figures on production and analyses at Guánica:

Date	Tns. cane per acre	Prix.	Sucrose	Purity	Tns. sugar per acre
Dec., 1913.....	66.47	.....	15.6	85.0	8.07
Dec., 1913.....	31.69	17.8	15.3	86.2	3.71
Feb., 1914.....	46.15	.....	14.7	81.4	4.48
B-2922 1914.....	.....	.....	.....	.....	6.86
March, 1914.....	45.57	.....	14.7	80.9	5.07
Av. Crop 1915.....	45.78	.....	13.4	80.8	4.26
March, 1916.....	36.47	.....	16.1	85.5	4.68
B-2922 1916.....	29.11	.....	16.2	81.3	3.87
D-117.....	36.17	.....	16.3	85.5	3.66

This is certainly quite a creditable record, although this variety is hardly cultivated now in Porto Rico.

\* G.C.-701.

Brought to the Station from Mayagüez in fall of 1925 by Mr. J. R. Saldaña. This cane, which was evidently a very good variety at Guánica and, according to Wolcott, rather exceptionally resistant to *Diatraea* attack, seems, along with the other G.C. seedlings, most of which have already disappeared completely, or are being rapidly eliminated in favor of B.H.-10(12) and S.C.-12/4. Mr. R. L. Page told the writer that this variety had the characteristic of splitting rather badly as it ripened.

We are now multiplying this kind for future tonnage experiments at the Station, where it has not yet been fully tested.

Erect or sub-declined. Stalks numerous, heavy, pale green. Internodes medium length. Nodes slightly constricted; root-band narrow; rudimentary roots with brownish centers in 2 or 3 rows; growth ring conspicuous, elevated; leaf scar short, heavily ciliate with pallid hairs; glaucous band narrow, somewhat constricted. Buds ovate, the margin shouldered above, at first flat, soon developing and prominent, often sprouting; apex and base minutely barbed. Leaf sheaths with heavy vestiture; shoulders both lobed; throat lannate but with scanty vestiture; ligule medium width, nearly even; collar lannate. Leaf blades declined, broad, serrulate throughout.

**\* G.C.-1480.**

Brought to the Station in fall of 1925 by Mr. J. A. Saldaña from Federal Agricultural Experiment Station in Mayagüez.

Erect, vigorous. Stalks stout, dull green tinted with red, quite glaucous. Internodes long, sub-cylindrical, nearly straight; furrow well marked. Nodes medium width, constricted; growth ring depressed; root-band narrow; rudimentary roots 2 to 3 in rows, often developing in the standing stalk; leaf scar glabrous, prominent, appressed behind; glaucous band poorly defined, blending with the bloom of the internode. Buds large, ovate-triangular, acute, appressed, but soon developed and prominent; margins broadest at base; apex and base barbed. Leaf sheaths with rather scanty vestiture; shoulders seldom lobed, throat with scanty vestiture and scarcely lannate; ligule short, even; collar glabrous. Leaf blades erect with tips declined, broad serrulate to base.

**\* G.C.-1486.**

Brought to the Station from the Federal Experiment Station in Mayagüez by Mr. J. A. Saldaña in the fall of 1925. It is now being multiplied for planting out in tonnage experiments.

Erect, vigorous. Stalks stout, green with red-brown tints when exposed, at length quite dark. Internodes tumid, inequilateral, slightly staggered; furrow evident. Nodes broad, somewhat constricted; root-band broad; rudimentary roots in 3 or 4 rows, often developing on the standing cane; leaf scar glabrous, prominent, appressed behind; glaucous band well marked. Buds large, triangular, appressed, then prominent; margin broad, inconspicuous, lobed, glabrate. Leaf sheaths with dense vestiture; throat with abundant vestiture extending up the leaf margins; ligule short, even; collar lannate, broad, the lobes brownish, the center pallid. Leaf blades broad, crowded, short, acuminate, sharply serrulate almost to base, margin ciliate at base.

**M.P.R.-50.**

Seedling of G.C.-1486. Brought to Station from Mayagüez in October, 1924, by Mr. J. A. Saldaña. This is about the best known of the Mayagüez seedlings, but as yet there has not been time to extend it sufficiently for definite trial at the Insular Station.

Erect and then recumbent, good vigor, fine stooler. Stalks long and stout, green to yellow, some flush and occasional perpendicular striations, scanty bloom. Internodes short to medium length, tumid, slightly staggered, no furrow. Nodes constricted and parallel; growth-ring narrow, 2 to 4 mm., widening at outer margin of curve, slightly sunken, bright red to concolorous; root band wide, yellowish-green



to concolorous; rudimentary roots large and prominent, few and scattered, 3 to 4 in rows, purplish to brown; leaf scar broad and prominent in front and appressed behind, glabrate; glaucous band medium width, constricted and conspicuous. Buds medium size, 7 by 9 mm., orbicular, plump, reaching growth-ring, germination subdorsal, margins medium width, on upper half only, abruptly shouldered at sides, purple, covered with scanty vestiture of short hairs, wide, sparse apical tuft, light basal plaes. Leaf sheaths with heavy vestiture of coarse hairs at back, margins glabrate, green, glaucous; throat broad, dark brown, covered with long, coarse hairs, which are especially abundant at sides; collar broad, reaching midrib, glaucous, dark brown, covered with minute hairs; ligule narrow at sides, wider and concave at center; no ligular process. Leaf blades spreading, medium width; about six cms., not flat, dark green, minutely and uniformly serrulated at margins, long, coarse, basal ciliae.

#### THE PORTO RICO SEEDLINGS PRODUCED IN 1912

\* **PR-202.** See Plate V, opposite page 239.

Parentage unknown.

Erect, vigorous, weak stooling, arrows occasionally. Stalks long, medium stout, green, little or no flush, heavy bloom. Internodes long, cylindrical, but enlarged below, staggered, furrow none. Nodes scarcely constricted, oblique; growth ring broad, 3 to 4 mm., swollen, the widest part of the stalk, conspicuous, yellowish-brown; root band oblique, 6 to 10 mm., tapering downward, concolorous; leaf scar glabrous, appressed behind; glaucous band scarcely constricted, partially obscured by the bloom of the internode. Buds subhemispheric, plump, about 12 by 12 mm., not exceeding the growth ring, margin narrow, uniform, germination subapical, basal plaes well developed, marginal and apical vestiture of long hairs and a short appressed pubescence extending well up on the sides of the bud. Leaf sheaths with a short vestiture when young, becoming glabrate, green, somewhat glaucous; throat narrow, densely lannate and with a sparse vestiture of short hairs on the margins; collar narrow, not reaching the midrib, dark brown, glaucous, the margins lannate; ligule short, 2 to 3 mm., minutely fimbriate; ligular processes none. Leaf blades erect except the tips, conspicuously plicate and revolute, broad, 9 cm. or more, minutely but sharply serrulate to the base, not ciliate.

This according to Earle, is a cane that is adapted to either low or hill lands. It does not mature quite as early as the *Cristalina*, still it may be used for either fall or spring planting. It does not usually ratoon well, and its disease resistance has not been fully tested. It was not included in the Santa Rita Immunity experiment.





inconspicuous, marginal vestiture scanty. Leaf sheaths with a short midrib, glaucous, the margins lannate; ligule narrow, 2 to 3., even, appressed vestiture, sometimes becoming glabrate, green or slightly tinted, glaucous; throat densely lannate, vestiture of long hairs scanty, mostly on the margins; collar well marked, reaching the midrib, glaucous, the margins lannate; ligule narrow, 2 to 3 mm., even; ligular processes rather short and broad, obtuse, on one side only. Leaf blades erect, the tips declined, flat, 6 to 7 cm., dark green, serrulate to the base, not ciliate.

This cane grows less rapidly at first than some of the others but it ultimately makes a good tonnage and ratoons well. It is a medium-season cane, not maturing quite as early as *Cristalina*, still it may be used for spring planting. Although it arrows freely if planted early, spring plantings seldom arrow and may be carried over. At the Station, planted, in May, 1918, it was not cut till April 1920 at 23 months old. It was in perfectly good condition, showing very few rotten canes. It is best planted in *vega* lands, but does fairly well in the hills. Its disease resistance has not been fully tested.

As seen from the following analyses, it develops very satisfactory sucrose and purity:

Kind	Date	Age	Arr.	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
P R-207	4-24-21	Pl.			19.1	17.55		91.8	
P R-207	April, 1918				19.50	16.79		85.84	
P R-207	6-1-18	Rat.			18.36	16.30		88.92	
P R-207	4-29-19	Rat.			20.0	18.80		90.40	
P R-207	1-13-20	Rat. 8 mo.		61.90	16.09	12.59		78.24	
Cristalina	1-13-20	Rat. 8 mo.				16.35			
P R-207	1-13-20	Pl. 10 mo.		64.97	17.22	14.51		84.26	
P R-207	April, 1920	Rat.		60.0	21.54	19.04		88.39	
P R-207	1-14-20	Pl. 20 mo.		62.88	18.68	17.13		91.70	
Cristalina	1-14-20	Pl. 20 mo.		60.22	17.46	15.93		91.23	
P R-207	1-21-21	Pl. 15 mo.	No.	67.10	16.8	14.28	1.26	85.0	13.16
Cristalina	1-21-21	Pl. 15 mo.	No.	70.0	17.25	15.96	0.37	92.52	9.60
P R-207	2-14-21	Pl. 16 mo.	No.	72.4	18.30	15.84	1.08	86.55	13.25
Rayada	2-14-21	Pl. 16 mo.	No.	63.6	17.15	15.25	0.81	88.92	12.37
P R-270	1-29-21	Pl. 18 mo.	No.	62.9	17.70	16.06	0.485	90.53	
P R-207	1-17-23	Pl. 13 mo.	Yes		16.80	12.53		74.60	
P R-207	2-18-23	Pl. 14 mo.	Yes		17.60	13.35		75.90	
P R-207	3-19-23	Pl. 15 mo.	Yes		15.00	10.01		66.80	

The last three analyses are from the records of Mr. Earle's experimental plantings of this variety at Aguirre, along with other P. R. seedlings. The analyses seem to amply justify his conclusion that this cane was of no value there—in fact the writer is inclined to think that those observations would apply anywhere and has discarded it from Station experiments. Mr. Luis Serrano, Assistant Agronomist at the Station, who helped him to make the selections of the earlier seedlings, agrees with him on this point.



P. R. 207



P. R. 209



Planted in the fall of 1924 alongside P.R.-292, 358 and 433, it proved decidedly inferior to the other three in general development, girth of stalk, stooling and susceptibility to *Helminthosporium* spot.

\*PR-208. See Plate V, opposite page 239.

Parentage unknown.

Erect, but at length declined, only medium vigor and stooling, seldom arrows. Stalks of medium length and diameter, green then yellowish with a pronounced red flush, light bloom. Internodes medium length, enlarged below and somewhat shouldered on side opposite bud, furrow well marked. Nodes constricted, but slightly oblique; growth ring narrow, often sunken, greenish; root band narrow, 6 to 8 cm., tapering downward, darker green; rudimentary roots small, crowded, brownish, in 3 or sometimes 4 rows; leaf scar glabrous, appressed behind; glaucous band constricted, about 8 mm., well defined. Buds triangular-ovate, apex narrow but obtuse, about  $12 \times 14$  mm., exceeding the growth ring by one-third or one-half, margin medium width, a little wider below but not shouldered, germination apical, basal places well developed, and with sparse marginal and apical vestiture. Leaf sheaths with a dense but rather short assurgent vestiture, green or slightly tinted, glaucous, somewhat stained with purple at base within; throat densely lannate, and with an abundant vestiture of medium-short hairs on the margins and behind the ligule, conspicuously pouched and wrinkled; collar conspicuous, dark brown, reaching the midrib, glaucous and lannate nearly to the middle; ligule abruptly wider at center, reaching 4 or 5 mm., the ends narrow, nearly even; ligular processes none or poorly developed. Leaf blades suberect, the tips declined, broad, flat, reaching 8 cm., dark green, minutely serrulate to the base, not ciliate.

This averages the richest in sucrose of any of the Porto Rico seedlings, but it can not be recommended for general planting since it does poorly on poor, dry, lands, where it suffers considerably from root disease. It is a desirable cane for rich, moist land and responds readily to increased applications of fertilizers. It develops sucrose fairly early but continues to make growth for a long season. It has been tested as a long-crop cane by Mr. Dreier and is well adapted to holding over. It may be planted either in fall or spring.

In the Santa Rita tests it proved to be rather more resistant to mosaic than Rayada. It has not been tested for gum disease. It is sometimes badly eaten by rats, as are most very sweet canes.

In a variety test at Central Mercedita, Yabucoa, on rich cow-penned land, cut February, 1920, as plant cane of 17 months, this



gave: tons per acre, 57.35; brix, 15.7; sucrose, 13.58; purity, 86.3. It was evidently still immature.

Kind	Date	Age	Arr.	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
PR-208	4-24-21	Pl.			19.3	18.44		95.5	
PR-208	5-4-16				19.4	18.44		95.05	
PR-208	4-25-17				24.80	23.10		98.41	
PR-208	2-12-18	Pl.			15.70	12.59		80.19	
PR-208	1-8-20	Rat. 14 mo.		58.13	17.12	14.71		85.92	
PR-208	12-10-20	Rat. 10 mo.	No	75.0	14.43	11.04	2.58	76.43	8.0
Rayada	12-10-20	Rat. 10 mo.	No	71.1	15.83	13.45	1.76	84.96	8.08
PR-208	12-22-20	Rat. 14 mo.	No	72.0	17.63	15.57	0.89	87.97	7.84
Cristalina	12-22-20	Rat. 14 mo.	No	70.0	17.50	15.53	0.28	88.74	9.60
PR-208	1-28-21	Rat. 15 mo.	No	72.7	18.15	16.43	0.71	90.18	13.15
Cristalina	1-28-21	Rat. 15 mo.	No	68.6	17.90	16.14	0.803	90.16	13.81
PR-208	1-19-21	Pl. 15 mo.	No	70.2	20.35	18.52	0.31	91.0	9.53
Cristalina	1-19-21	Pl. 15 mo.	No	70.0	17.25	15.96	0.37	82.62	9.60
PR-208	2-14-21	Pl. 16 mo.	No	70.2	18.75	17.0	0.71	90.66	10.36
Rayada	2-14-21	Pl. 16 mo.	No	68.6	17.15	15.25	0.81	88.92	12.37
PR-208	4-29-21	Pl. 18 mo.	No	65.6	21.26	19.90	0.168	93.50	
Cristalina	4-29-21	Pl. 18 mo.	No	65.1	19.55	18.93	0.241	96.82	

\*PR-209. See Plate XXV, opposite page 241.

Parentage unknown.

Erect, or sometimes tardily decumbent, good vigor, medium stooling, sometimes arrows. Stalks long, medium diameter, green, then yellow, with faint reddish flush, no bloom. Internodes medium to short, lightly compressed, strongly staggered, furrow none. Nodes prominent, scarcely constricted, oblique; growth ring broad, 2 to 4 mm., elevated, concolorous, then brownish; root band oblique, 6 to 10 mm., concolorous; rudimentary roots large, crowded, yellowish, in about 3 rows; leaf scar minutely appressed, ciliate then glabrate, appressed behind; glaucous band about 8 mm., scarcely constricted, well defined. Buds broadly ovate or subhemispheric, obtusely rounded, about 12 to 14 × 12 to 14 mm., exceeding the growth ring by one-fourth to one-third, margin narrow but shouldered, germination dorsal, often germinating prominently on the standing stalk, basal plac well developed, marginal vestiture scanty but ending in a conspicuous apical tuft. Leaf sheaths with heavy vestiture of appressed white hairs, green, glaucous, faintly stained with purple at the base within; throat densely lannate and with an abundant vestiture of long hairs on margins and behind ligule; collar broad, reaching the midrib, lannate; ligule medium, about 3 mm., even; ligular processes sometimes present, often poorly developed. Leaf blades erect except the tips, somewhat two-ranked, flat, broad, 9 to 10 cm., dark green, minutely serrulate, the base even and ciliate.

This is another cane that can only be recommended for moist, rich soils. It is a failure on poor hill land. Where conditions are favorable it makes heavy tonnage and develops a good degree of sucrose. It responds to heavy applications of fertilizers on moist lands.

It is better for fall than for spring planting. In the Santa Rita experiment it suffered more than Rayada from both root disease and mosaic. It has not been tested for gum disease, nor will it be, as we have decided to abandon it at the Station and it has not been distributed.

Kind	Date	Age	Arr.	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
P R-209	4-24-13	Pl.			17.4	15.44		90.4	
P R-209	5-4-16				16.4	14.50		88.41	
P R-209	4-15-17				22.38	20.56		91.60	
P R-209	April, 1918	Pl.			16.30	13.55		81.80	
P R-209	4-28-19	Rat.		55.0	19.20	17.4		90.63	
P R-209	1-13-20	Rat. 8 mo.		63.33	13.38	9.72		72.64	
Cristalina	1-13-20	Rat. 8 mo.				16.35			
P R-209	April, 1920	Rat. 11 mo.		68.91	19.41	17.31		88.25	
P R-209	12-13-20	Rat. 10 mo.	No.	71.60	14.79	11.71	2.11	79.1	10.22
Rayada	12-13-20	Rat. 10 mo.	No.	71.10	15.83	13.45	1.76	84.96	8.08
P R-209	1-21-21	Pl. 15.	Yes.	64.3	17.30	15.02	1.15	86.82	12.85
Cristalina	1-21-21	Pl. 15.	No.	70.0	17.25	15.96	0.37	92.52	9.60
P R-209	2-14-21	Pl. 16.	No.	68.0	18.75	17.05	0.62	90.93	12.37
Rayada	2-14-21	Pl. 16.	No.	63.6	17.15	15.26	0.81	88.92	12.37
P R-209	4-30-21	Pl. 18.	No.	62.7	17.45	16.47	0.751	91.75	
P R-209	4-30-21	Pl. 18.	Yes.	65.7	18.50	16.98	0.628	91.78	
P R-209	1-17-23	Pl. 13 mo.	Yes		18.80	16.26		86.50	
P R-209	2-19-23	Pl. 14 mo.	Yes		17.10	13.83		81.00	
P R-209	3-21-23	Pl. 15 mo.	Yes		17.80	15.34		87.40	

The last three analyses are taken from Earle's notes on his Aguirre experiments and amply justify his conclusion that P.R.-209 is of no value in Aguirre. In June, 1925, Mr. Dreier at the Hatillo Fruit Farm harvested one of the most beautiful fields of this variety that the author has ever seen, but its sugar content was so low at Central Victoria that it hardly paid expenses. It takes gumming disease.

\* PR-210.

Parentage unknown.

Strictly erect, medium vigor and stooling, seldom arrows. Stalks medium diameter, green then yellowish, with a red flush, no bloom. Internodes medium length, cylindrical, straight, furrow none. Nodes not constricted, scarcely oblique; growth ring narrow, 1 to 2 mm., nearly even, usually concolorous or sometimes brownish; root band narrow, 6 to 8 mm., concolorous or darker; rudimentary roots small, crowded, in about 3 rows; leaf scar glabrous, appressed behind; glaucous band about 8 mm., well marked. Buds suborbicular, often slightly wider than long, 9 to 10 × 8 to 9 mm., very slightly exceeding growth ring, margin medium, somewhat shouldered, germination subapical, basal places short, marginal and apical vestiture scanty but with more or less short pubescence well up on sides. Leaf sheaths with a moderate vestiture, green, not glaucous; throat dark brown,

strongly lannate, with an abundant vestiture of hairs on the margins; collar dark brown, glaucous, the margins densely lannate; ligule about 4 mm., the margin fimbriate and ciliate; ligular processes, one usually well developed about 12 mm., acute. Leaf blades strictly erect, narrow, 5 or 6 cm., flat, somewhat two-ranked, medium green, sharply serrulate to the base not ciliate.

This is another cane that can hardly be recommended for general planting. It requires rich land and good treatment, when it yields a heavy tonnage. It does not mature quite as early as *Cristalina*, still it can be used for spring planting. It grows so strictly erect that it should be planted closer than other kinds. It stands up well and is seldom damaged by rats. It was tested for the alluvial irrigated lands of the south coast by Earle and proved of doubtful value—see last analyses below.

In Santa Rita Experiment it made a good showing, being decidedly more resistant to mosaic than *Rayada*. On poor lands, however, it often suffers from root disease. It has not been tested for gum disease.

In the variety experiment at Central Mercedita, Yabucoa, on rich cowpened land this cane made a fine showing, being third in tonnage. Its record was, February 1920, plant cane 17 months, tons per acre, 57.55; brix, 15.80; sucrose, 13.12; purity, 83.0. This would indicate 5.399 tons sugar per acre. Other records follow:

Kind	Date	Age	Arr.	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
PR-210 .....	4-25-13	Pl. ....	.....	.....	19.4	17.54	.....	90.4	.....
PR-210 .....	5-4-16	.....	.....	.....	17.6	16.17	.....	91.87	.....
PR-210 (1) ..	4-25-17	.....	.....	.....	23.38	21.30	.....	91.10	.....
PR-210 .....	12-8-20	Rat. 10 mo. ....	No	71.4	14.93	11.81	2.71	79.10	9.15
<i>Cristalina</i> ..	12-8-20	Rat. 10 mo. ....	No	73.0	15.63	13.41	1.78	85.75	10.80
PR-210 .....	1-21-21	Pl. 15 mo. ....	No	70.9	16.90	14.22	1.77	84.14	11.64
<i>Cristalina</i> ..	1-21-21	Pl. 15 mo. ....	No	70.0	17.25	16.96	0.37	92.52	9.60
PR-210 .....	3-3-21	Pl. 16 mo. ....	No	69.7	18.20	16.62	0.89	91.31	12.72
<i>Rayada</i> .....	3-3-21	Pl. 16 mo. ....	No	72.7	18.25	16.30	0.71	89.31	12.00
PR-210 .....	4-30-21	Pl. 18 mo. ....	No	66.6	19.50	18.06	0.491	92.11	.....
PR 210 .....	1-17-23	Pl. 13 mo. ....	No	.....	17.75	13.58	.....	76.50	.....
PR-210 .....	2-19-23	Pl. 14 mo. ....	No	.....	20.00	17.09	.....	85.40	.....
PR 210 .....	3-21-23	Pl. 15 mo. ....	No	.....	17.90	14.46	.....	81.20	.....

(1) Sixth in tons cane out of 47 kinds.

\* PR-219.

Parent, D-117.

Erect, or finally decumbent, good vigor, medium stooling, arrows freely. Stalks long, medium diameter, green with a slight red flush, light bloom. Internodes medium to long, enlarged but hardly shouldered below, slightly staggered, furrow none. Nodes slightly constricted, somewhat oblique, growth ring about 2 mm., somewhat elevated, constituting the thickest part of the stalk, brownish-green;

root band 7 to 10 mm., concolorous or rather brighter green, tapering downward; rudimentary roots small crowded, pale brownish, in 4 or sometimes 5 rows; leaf scar glabrous, appressed behind; glaucous band about 8 mm., slightly constricted, well defined. Buds broadly ovate, subacute about 10 to 14  $\times$  10 to 14 mm., slightly exceeding the growth ring, margin narrow, uniform, germination sub-apical, basal plac short but well developed, marginal and apical vestiture medium. Leaf sheaths with a sparing vestiture of short hairs on the back, at length sometimes glabrate, green or slightly tinted, somewhat glaucous, stained with purple at base within; throat densely lannate and with an abundant vestiture of hairs on the margins and behind the ligule; collar narrow, reaching the midrib, glaucous, the margin lannate; ligule about 3 mm., even; ligular processes sometimes one strongly developed reaching 25 to 30 mm., acute, sometimes wanting. Leaf blades erect except the tips, rather narrow especially at the base, reaching 6 cm. above the middle, flat or somewhat plicate, medium green, minutely serrulate, not ciliate above the throat. (Hardly distinguishable from D-117.)

This cane grows vigorously but it does not seem to last well in the field after arrowing, usually showing considerable top rot and rind disease. It is known to contract mosaic but how badly it is injured has not been determined. It should probably be abandoned as there are many other equally good canes without these faults.

Its sucrose record follows:

Kind	Date	Age	Arr.	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
PR-219	2-22-13	Plant			17.4	14.54		83.5	
PR-219	5-4-16	Plant			17.1	15.13		88.7	
PR-219 (1)	4-25-17	Plant			21.45	19.9		92.77	
PR-219	4-2-19	Rat. 11 mo.		50.06	19.7	18.0		91.36	
PR-219	Apr. 1918	Pl. 11 mo.			18.85	16.4		85.09	
PR-219	1-13-20	Rat. 8 mo.		59.52	16.46	13.84		84.08	
Cristalina	1-13-20	Rat. 8 mo.				16.35			
PR-215	Apr. 1920	Rat. 11 mo.		66.63	20.14	18.10		89.87	
PR-219	12-8-20	Rat. 10 mo.	No	73.5	13.83	9.70		70.13	7.42
Rayada	12-8-20	Rat. 10 mo.	No	71.1	17.83	13.45	1.76	84.96	8.08
PR-219 (2)	1-21-21	Pl. 15 mo.	Yes	67.2	19.10	16.82	0.94	88.06	11.15
Cristalina	1-21-21	Pl. 15 mo.	No	70.0	17.25	15.96	0.37	92.52	9.60
Tns. Cane per acre									
PR-219	1-17-23	Pl. 13 mo.	No	Aguirre	21.50	18.45		85.70	
PR-219	2-19-23	Pl. 14 mo.	No	Aguirre	20.00	18.85		91.20	
PR-219	3-21-23	Pl. 15 mo.	No	Aguirre	20.70	18.41		89.00	
Tns. Cane per acre									
PR-219	3-21-24	Pl. 19 mo.	No	Hatillo	42.45	18.47		91.20	
Rayada	3-21-24	Pl. 19 mo.	No	Hatillo	22.20	16.51		91.00	
PR-219	12-9-24	Pl. 9 mo.	No	Hatillo		11.73		77.17	

(1) Second in tons cane out of 47 kinds.

(2) Third in sucrose out of 40 kinds to date.

#### \* PR-230.

Parentage unknown, but probably seedling of D-117.

Erect or at length decumbent, vigorous, good stooler, arrows



freely. Stalks medium length and diameter, green then yellow, little or no flush, no bloom. Internodes medium to long, at first cylindrical then tumid on side behind the bud, somewhat staggered, furrow usually none. Nodes slightly constricted, somewhat oblique; growth ring broad, often 3 or more mm., somewhat elevated, brownish; root band 8 to 10 mm., somewhat constricted, nearly concolorous; rudimentary roots large, crowded, yellowish brown, in about 3 rows; leaf scar glabrous, appressed behind; glaucous band narrow, 6 to 7 mm., slightly constricted, well defined. Buds ovate, obtuse, at first about  $10 \times 10$  mm., often soon expanding, usually purplish, exceeding the growth ring, margin rather broad, uniform germination sub-apical, basal places short and scanty, margins nearly glabrate, a scanty apical tuft from behind the bud. Leaf sheaths at first with a moderate vestiture, becoming glabrate, green, somewhat glaucous; throat lannate, with a sparse vestiture of short hairs on the margins and behind the ligule; collar narrow, reaching the midrib, glaucous or the margins slightly lannate; ligule about 3 mm., the margin fimbriate and ciliate; ligular processes usually one moderately developed. Leaf blades suberect, the tips declined, flat, about 6 to 7 cm. wide, bright green, minutely serrulate, the base even and slightly ciliate.

This cane somewhat closely resembles D-117 but the foliage is lighter in color, the buds are more nearly glabrate and the collar is less lannate.

It is a rather promising cane, especially for the red shale hills, where it ratoons strongly. It does not mature quite as early as Cristalina, but may be used for either fall or spring planting.

It has good resistance to root disease, as shown by its good ratooning power. Its resistance to mosaic and gum disease has not been determined.

Its record for sucrose follows:

Kind	Date	Age	Arr.	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
P R-230	4-25-13	Pl.			15.8	12.42		78.6	
P R-230 (1)	5-4-16				20.5	17.04		83.12	
P R-230	4-25-17				22.51	20.70		91.96	
P R-230	April, 1918	Pl. 11 mo.			21.50	19.10		88.83	
P R-230	4-28-19	Rat. 12 mo.		59.0	20.50	18.38		89.05	
P R-230	1-13-20	Rat. 8 mo.		64.91	17.80	15.00		84.55	
Cristalina	1-13-20	Rat. 8 mo.				16.35			
P R-230	April, 1920	Rat. 11 mo.		61.90	22.01	20.23		91.91	
P R-230	12-8-20	Rat. 10 mo.	No.	75.0	12.53	8.02	3.65	64.0	9.0
Rayada	12-8-20	Rat. 10 mo.	No.	71.1	15.83	13.45	1.76	84.96	8.08
P R-230	1-21-21	Pl. 15 mo.	Yes.	67.2	18.30	15.38	1.31	84.04	12.46
Cristalina	1-21-21	Pl. 15 mo.	No.	70.0	17.25	15.96	0.37	92.52	9.60
P R-230	2-14-21	Pl. 16 mo.	No.	69.5	17.85	15.58	1.07	86.79	12.20
Rayada	2-14-21	Pl. 16 mo.	No.	68.6	17.15	15.25	0.81	88.92	12.37
P R-230	1-17-23	Pl. 13 mo.	No.	Aguirre	22.00	19.41		88.30	
P R-230	2-23-23	Pl. 14 mo.	No.	Aguirre	20.20	17.19		85.00	
P R-230	12-22-24	Pl. 17 mo.	No.	Aguirre	18.20	16.36		89.70	
P R-230	12-28-24	Pl. 16 mo.	No.	Aguirre	18.40	16.46		89.50	

(1) Third in tons cane out of 47 kinds.



The figures would indicate, as Earle remarks in his Aguirre notes, that this variety is worth further trial. We have it planted out in tonnage experiments at the Station in comparison with the other P.R. seedlings and B.H.-10(12) and it is looking very well at present.

\* **PR-260.** See Plate V, opposite page 239.

**Parentage unknown:**

Erect, vigorous, medium stooling, arrows freely. Stalks long, medium diameter, green, then yellow, with a faint flush, medium heavy bloom. Internodes medium to long, cylindrical, slightly staggered, furrow usually evident for full length of internode. Nodes scarcely constricted, somewhat oblique; growth ring narrow, even, concolorous; root band 8 to 10 mm., concolorous; rudimentary roots large, indistinct, in about 3 rows; leaf-scar glabrous, constricted behind. Buds narrowly ovate, acute, about  $10 \times 14$  mm., but often soon considerably elongated, exceeding the growth ring by one-third to one-half, margin medium width, uniform, germination apical, basal plaes heavy with a conspicuous tuft on shoulders, margin glabrate, but sparse, apical tuft. Leaf sheaths with a heavy stiff vestiture, green, a little glaucous, stained with purple at base within; throat lannate, with a vestiture of rather short hairs on the margins; collar reaching the midrib, lannate; ligule about 3 mm., fimbriate; ligular processes one usually developed, about  $1\frac{1}{4}$  mm., obtuse. Leaf blades erect except the tips, flat, about 7 cm. wide, medium green, minutely but sharply serrulate, the base not ciliate.

This is one of the best canes in this series. It does fairly well on hills but is best on rich *vega* land. It matures rather late and so is best planted in the fall. On suitable soils it gives a very heavy tonnage and ratoons well. Its planting was at one time considerably extended in the Guánica district.

In the Santa Rita immunity experiment it proved to be rather unusually resistant to mosaic and its seedlings, a number of which have been grown at the Mayagüez Station, seem to quite uniformly inherit this characteristic. The writer has seen it heavily infected with gum disease.

In a variety test on rich cow-penned land at Central Mercedita, Yabucoa, it made the highest tonnage of any cane tested. Cut February, 1920, as plant cane at 17 months, it gave: tons cane per acre, 78.82; brix, 14.55; sucrose, 11.18; purity, 76.7; tons sugar per acre,

6.313. Clearly this cane was still green or the yield of sugar would have been much higher. Other analyses follow:

Kind	Date	Age	Arr.	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
P R-290	4-24-12	Pl.			18.2	17.7		98.2	
P R-290	5-4-12				18.5	17.68		95.56	
P R-290	4-25-17				20.91	18.50		89.75	
P R-290	4-22-17	Pl.			17.70	14.73		83.22	
P R-290	2-1-12	Rat. 12 mo.			14.00	12.50		85.61	
P R-290	12-4-20	Rat. 10 mo.		78.0	14.42	10.52	2.85	72.90	7.56
Cristallina	12-4-20	Rat. 10 mo.		78.0	15.63	12.61	1.78	85.76	10.80
P R-290	12-22-20	Rat. 14 mo.	No.	69.2	15.40	12.45	1.47	80.84	12.44
P R-290	12-22-20	Rat. 14 mo.	Yes.	65.0	17.00	14.81	0.61	87.11	14.00
Cristallina	12-22-20	Rat. 14 mo.	No.	70.3	17.85	16.14	0.33	90.42	10.69
P R-290	1-21-21	Pl. 15 mo.	Yes.	67.2	18.10	15.50	0.77	85.63	11.80
Cristallina	1-21-21	Pl. 15 mo.	No.	70.0	17.25	15.96	0.37	92.52	9.60
P R-290	2-28-21	Pl. 16 mo.	No.	64.2	17.85	15.90	0.62	89.07	12.88
P R-290	2-28-21	Pl. 16 mo.	Yes.	65.1	17.95	15.73	0.75	87.47	13.95
Rayada	2-28-21	Pl. 16 mo.	No.	63.6	17.15	15.25	0.81	88.92	12.37
P R-290	5-2-21	Pl. 18 mo.	Yes.	66.1	19.70	18.18	0.333	92.28	
P R-290	1-13-23	Pl. 13 mo.	Yes.		16.25	14.28		78.30	
P R-290	2-20-23	Pl. 14 mo.	Yes.		17.70	13.55		76.50	
P R-290	3-21-23	Pl. 15 mo.	Yes.		20.90	14.92		90.60	
P R-290	12-2-24	Pl. 16 mo.	Yes.		16.50	12.67		82.90	
P R-290	12-15-24	Pl. 17 mo.	Yes.		17.60	15.32		87.10	

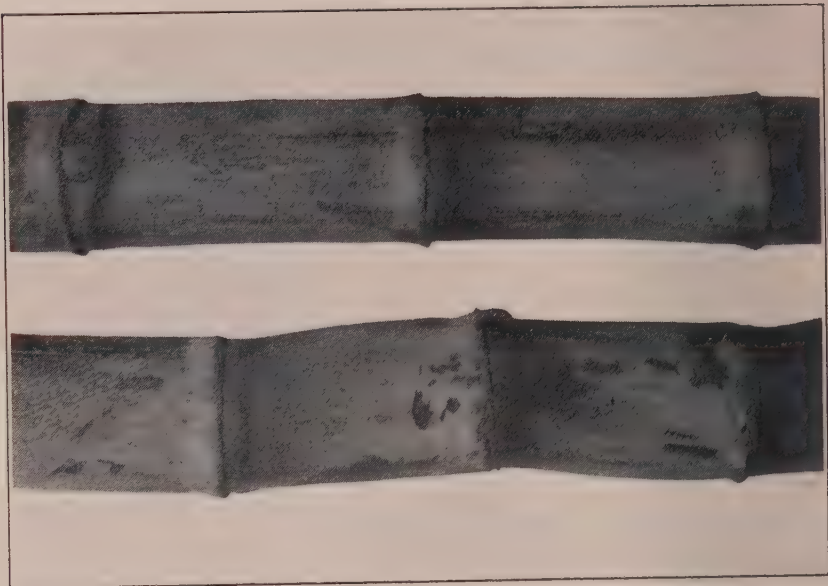
Earle found at Aguirre that it germinated poorly in most plantings and in tonnage experiments on rather poor *vega* land at the Station it has uniformly ratooned poorly. Foss finds it in general "above the average" in Aguirre.

\* PR-270.

Parentage unknown.

Soon decumbent and prostrate, vigorous, medium stooler, arrows frequently. Stalks long, medium diameter, bright green, sometimes with pink flush, no bloom. Internodes medium length, cylindrical, somewhat staggered, furrow none or evident only on the lower internodes. Nodes scarcely constricted, oblique; growth ring broad but indistinct, even, concolorous; root band 8 to 10 mm., concolorous; rudimentary roots crowded, pallid, in 3 or 4 rows; leaf scar glabrous, narrow, appressed behind; glaucous band wide, 10 mm., slightly constricted, well defined. Buds oval, 7 to 10 / 8 to 12 mm., not exceeding the growth ring, margin rather broad, uniform, germination subapical or subdorsal, basal plaes short, margins nearly glabrate but with a few scattered hairs, a sparse apical tuft from behind the bud. Leaf sheaths with heavy stiff vestiture, green, scarcely glaucous; throat densely lannate and with scanty marginal vestiture; collar reaching the midrib, glaucous, the margins lannate; ligule short, 2 or 3 mm., even; ligular processes when present reduced to a blunt lateral protuberance. Leaf blades erect except the tips, somewhat plicate and inrolled, 7 to 7½ cm., sharply serrulate to the base not ciliate.





P. R. 271



P. R. 358

This is a good vigorous cane, but with nothing to particularly recommend it. It is rather late in maturing. In the immunity tests at Santa Rita it made a poor showing, being badly injured by root disease and top rot and suffering seriously from mosaic.

It develops good sucrose but only when fully mature:

Kind	Date	Age	Arr.	Extr.	Brlx.	Sucr.	R. S.	Purity	Fiber
P R-270 .....	4-24-18	Pl. ....	.....	.....	19.3	17.28	.....	89.5	.....
P R-270 .....	5-4-18	.....	.....	.....	18.2	16.44	.....	90.32	.....
P R-270 .....	4-25-17	.....	.....	.....	22.20	20.50	.....	92.34	.....
P R-270 .....	April, 1918	Pl. 11 mo. ....	.....	.....	18.65	15.59	.....	85.20	.....
P R-270 .....	4-28-19	Rat. 12 mo. ....	.....	58.00	20.00	18.25	.....	91.25	.....
P R-270 .....	1-14-20	Rat. 12 mo. ....	.....	63.04	16.72	18.31	.....	84.69	.....
Cristallina .....	1-14-20	Rat. 12 mo. ....	.....	60.22	17.46	15.93	.....	91.23	.....
P R-270 .....	4-5-20	Pl. 13 mo. ....	.....	60.00	21.39	18.35	.....	90.40	.....
Rayada .....	12-10-20	Rat. 10 mo. ....	No. .	71.10	15.83	18.45	1.76	84.90	8.68
P R-270 .....	12-10-20	Rat. 10 mo. ....	No. .	69.00	14.33	10.69	3.00	74.50	7.44
P R-270 .....	2-2-21	Rat. 10 mo. ....	No. .	67.80	17.40	14.97	1.19	86.03	12.42
P R-270 .....	2-2-21	Rat. 10 mo. ....	Yes.	70.90	17.55	15.20	0.95	86.60	12.80
P R-270 .....	2-28-21	Pl. 16 mo. ....	No. .	61.9	17.75	15.98	0.62	90.02	12.22
P R-270 .....	2-28-21	Pl. 16 mo. ....	Yes.	66.6	17.20	16.56	0.64	98.14	12.48
Rayada .....	2-28-21	Pl. 16 mo. ....	No. .	63.6	17.15	15.26	0.81	81.92	12.37

\* PR-271. See Plate XXVI, opposite page 249.

Parentage unknown.

Erect or at length declined, vigorous, moderate stooling, arrows frequently. Stalks long, medium to medium stout, green then yellow, often a slight purplish flush, heavy bloom. Internodes medium length, cylindrical, staggered, furrow usually none. Nodes scarcely constricted, somewhat oblique; growth ring rather broad but indistinct, greenish or brownish; root band narrow, 6 to 8 mm., concolorous; rudimentary roots large but indistinct, in 2 or 3 rows; leaf scar glabrous, narrow, appressed behind; glaucous band broad, 10 to 12 mm., very slightly constricted, not well defined. Buds triangular, ovate, 12 to 12  $\times$  11 to 12 mm., slightly exceeding the growth ring, margin rather broad, a little wider below but not shouldered, germination apical or subapical, heavy basal plates, moderate marginal vestiture extending well up on sides of bud and conspicuous apical tuft. Leaf sheaths with dense harsh vestiture, green a little glaucous; throat densely lannate, and with a heavy vestiture of medium short hairs on the margins and behind the ligule; collar reaching the midrib, lannate; ligule about 3 mm., even; ligular processes usually none. Leaf blades erect almost to the tips, somewhat plicate, two-ranked, broad, 8 or 9 cm., sharply serrulate to the base, not ciliate.

This is one of the best general-purpose canes in this series but it is a little late in maturing and so should be used for fall planting. It succeeds well on either high or low land.

It is known to be attacked by mosaic, but it was not included in the Santa Rita experiment, so its disease resistance has not been fully tested.



When immature it is very low in sucrose but develops a good percentage at maturity.

Kind	Date	Age	Arr.	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
PR-271	4-25-13	Pl			19.50	17.91		91.8	
PR-271	5-4-16				20.50	19.52		95.21	
PR-271	4-25-17				22.85	21.00		91.90	
PR-271	4-5-18	Pl. 11 mo.			20.15	17.83		88.48	
PR-271	4-29-19	Rat. 12 mo.		58.2	20.30	18.47		91.0	
PR-271	1-13-20	Rat. 8 mo.		63.46		18.50		83.38	
Cristalina	1-13-20	Rat. 8 mo.			16.19	16.35			
PR-271	Apr. 1919	Rat. 11 mo.		66.66	20.44	18.67		91.63	
PR-271	2-28-20	Pl. 16 mo.	No	71.60	18.55	16.62	0.65	91.21	12.49
Rayada	2-28-20	Pl. 16 mo.	No	63.60	17.15	15.27	0.81	88.92	12.57
PR-271	5-4-21	Pl. 18 mo.	Yes	67.2	19.60	18.20	0.475	93.36	
PR-271	1-18-23	Pl. 13 mo.	No		19.60	17.18		87.40	
PR-271	2-23-23	Pl. 14 mo.	No		21.15	18.17		88.70	
PR-271	3-20-23	Pl. 15 mo.	No		19.70	17.44		88.50	
PR-271	4-16-23	Pl. 16 mo.	No		19.55	18.07		92.40	

This cane gives good tonnage, keeps remarkably well in the field and is one of the most generally promising canes in this series. For this reason it is hard to understand it having disappeared from the Station when the writer arrived here in 1923. He obtained seed from W. C. Dreier, of the Hatillo Fruit Co. Farm on the Trujillo Alto Road near the Station, where it has been giving excellent results for years, and it is now planted out in tonnage experiments with the remaining P.R. seedlings and with B.H.-10(12) for a check. It is looking very well indeed at present.

\* PR-272.

Parentage unknown.

Erect or at length decumbent, moderate vigor and stooling, seldom arrows. Stalks medium length and diameter green or yellowish, usually with pink flush, no bloom. Internodes medium length, cylindrical or somewhat larger below, straight, furrow none. Nodes scarcely constricted, nearly rectangular; growth ring 2 or 3 mm., usually elevated, rather inconspicuous; root band about 8 mm., the base constricted, tapering downward, concolorous, rudimentary roots large, whitish, in 2 or 3 rows; leaf scar at first somewhat ciliate below the bud, then glabrate, appressed behind; glaucous band about 6 mm., poorly defined. Buds broadly oval, usually reddish, about  $9 \times 10$  mm., not exceeding the growth ring, margin narrow, uniform, germination subdorsal, almost glabrate, basal places greatly reduced and very scanty marginal vestiture. Leaf sheaths with vestiture of soft hairs, at length often nearly glabrate, green but somewhat tinted, somewhat glaucous, hanging long on the stalk; slightly stained purple at base within; throat lannate and with an abundant vestiture of hairs on margins and behind ligule; collar broad, deeply wrinkled, reaching

the midrib, glaucous or slightly lannate on margins; ligule abruptly widened at center, reaching 5 mm., fimbriate and ciliate; ligular processes on one side only, short, obtuse. Leaf blades spreading, strongly revolute, about 7 cm., light green, minutely serrulate, the base not ciliate.

This cane is not desirable for general planting, since it is lacking in vigor on poor hill lands. It is adapted to moist *regas*. It ripens fairly early and develops high sucrose at full maturity. Its disease resistance has not been fully tested.

It made a good record in the rich cow-penned land in the variety tests at Centrad Mercedita, Yabucoa, where, cut in February, 1920, as plant cane at 16 months, it gave: tons cane, 59.46; brix, 14.90; sucrose, 12.81; purity, 85.3. It was evidently not fully matured, since, as seen in the following analyses, the sucrose should go much higher:

Kind	Date	Age	Arr.	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
P R-272 .....	4-24-13	Pl. ....	.....	.....	18.6	17.05	.....	91.6	.....
P R-272 .....	5-4-16	.....	.....	.....	21.3	20.97	.....	98.45	.....
P R-272 .....	4-25-17	.....	.....	.....	22.58	20.50	.....	90.79	.....
P R-272 .....	2-4-18	Pl. ....	.....	.....	12.87	10.00	.....	77.70	.....
P R-272 .....	1-7-20	Rat. 14 mo. ....	.....	56.61	17.07	14.76	.....	86.46	.....
P R-272 .....	12-13-20	Rat. 10 mo. ....	.....	71.1	15.43	12.84	1.74	81.20	9.24
Cristalina .....	12-13-20	Rat. 10 mo. ....	No	.....	.....	13.41	1.78	85.76	10.80
P R-272 .....	12-18-20	Rat. 14 mo. ....	No	69.1	17.50	15.17	1.01	86.66	9.88
Cristalina .....	12-18-20	Rat. 14 mo. ....	No	70.0	17.60	15.53	0.28	88.74	9.60
P R-272 .....	2-28-21	Pl. 16 mo. ....	No	68.6	19.60	18.44	0.74	92.33	11.25
Rayada .....	2-28-21	Pl. 16 mo. ....	No	63.6	17.15	15.25	0.81	78.92	12.47
P R-272 .....	5-4-21	Pl. 18 mo. ....	No	60.9	20.55	18.35	0.265	93.91	.....
<hr/>									
P R-272 .....	1-18-23	Pl. 13 mo. ....	No	.....	19.70	18.71	.....	85.20	.....
P R-272 .....	2-20-23	Pl. 14 mo. ....	No	.....	19.60	14.95	.....	76.30	.....
P R-272 .....	3-21-23	Pl. 15 mo. ....	No	.....	20.30	18.80	.....	90.20	.....

Earle remarks in his Aguirre notes, from which the last series of analyses is taken, that the variety has no value there and our experience here at the Station has led us to the conclusion that this classification would apply to it under most conditions, hence we have ceased to experiment with it at the Station. Planted at the Station in a plat with P.R.-270, 292 and 358, it was definitely inferior to the other three in development and general stooling. This plat was planted in the fall of 1924 and no further plantings of this variety have since been made.

\* **PR-292.** See Plate V, opposite page 239.

Parent, D-117.

Erect, or at length somewhat declined, vigorous, good stooler, arrows, freely. Stalks long, medium diameter, green with strong red flush, heavy bloom. Internodes long, enlarged below, staggered, furrow none. Nodes constricted, oblique; growth ring about 2 mm., brownish, somewhat elevated; root band 6 to 8 mm., tapering down-

wards, the base constricted, concolorous; rudimentary roots obscure, in about 3 rows; leaf scar glabrous, narrow, not much compressed behind; glaucous band constricted, 8 to 10 mm. wide, poorly defined. Buds broadly triangular-ovate but seeming obovate from the flaring margin, about  $11 \times 10$  mm., scarcely exceeding the growth ring, margin, about  $10 \times 10$  mm., scarcely exceeding the growth ring, margin very wide and with long shoulders almost to the emerginate tip, germination subapical, basal place scanty but extending half way up on the shoulders, marginal vestiture above the place very scanty, apex glabrous. Leaf sheaths with short appressed vestiture, green, somewhat tinted, slightly glaucous, stained with purple at the base within; throat densely lannate and with vestiture of rather short hairs on the margins and behind the ligule; collar reaching the midrib, glaucous, the margins minutely lannate; ligule short, about 2 mm., fimbriate; ligular processes reduced to a scarcely noticeable lateral protuberance on one side. Leaf blades erect except the tips, somewhat plicate, or nearly flat, 7 or 8 cm. wide, dark green, minutely serrulate, the base even, sometimes slightly ciliate.

This is a good general-purpose cane. It can be especially recommended for the red shale hills, where it gives heavy tonnage and ratoons remarkably well. It does not ripen quite as early as Cristalina, still it may be used for either fall or spring planting. It arrows too freely to be held over as long crop or *caña quedada*.

It made a good record in the Santa Rita immunity tests, being rather more resistant than Rayada to both root disease and mosaic. It has not been tested for gum disease.

Kind	Date	Age	Arr.	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
PR-292	4-23-18	Pl			17.94	15.70		87.5	
PR-292	5-5-16				19.10	16.70		86.91	
PR-292	4-25-17				22.55	21.50		95.34	
PR-292	2-4-18	Pl			16.50	14.10		85.4	
PR-292	1-18-20	Rat. 14 mo.		59.49	15.32	12.98		84.59	
PR-292	12-10-20	Rat. 10 mo.	No	72.70	15.28	12.10	2.47	79.44	8.78
Rayada	12-10-20	Rat. 10 mo.	No	71.10	15.83	13.45	1.76	84.96	8.08
PR-292	12-18-20	Rat. 14 mo.	No	67.20	16.68	14.8	0.86	85.86	9.84
PR-292	12-18-20	Rat. 14 mo.	Yes	65.60	17.03	14.79	0.63	86.86	11.69
Cristalina	12-18-20	Rat. 14 mo.	No	70.00	17.50	15.5	0.28	88.74	9.60
PR-292	2-7-21	Pl. 16 mo.	No	66.6	18.50	16.8	0.65	90.81	
PR-292	2-7-21	Pl. 16 mo.	Yes	61.9	18.20	16.45	0.55	90.38	12.95
PR-292	2-7-21	Pl. 16 mo.	No	68.6	17.90	16.14	0.803	90.16	13.81
Cristalina	2-28-21	Pl. 16 mo.	No	69.4	19.60	18.11	0.41	92.59	12.24
PR-292	2-28-21	Pl. 16 mo.	Yes	67.9	19.25	17.28	0.49	89.76	12.84
PR-292	2-28-21	Pl. 16 mo.	No	68.6	17.15	15.25	0.81	88.92	12.37
Rayada	5-4-21	Pl. 18 mo.	No	60.0	19.20	17.97	0.289	93.96	
PR-292	5-4-21	Pl. 18 mo.	Yes	72.4	20.00	18.57	0.601	92.85	
PR-292	1-18-23	Pl. 13 mo.	No	Aguirre	17.95	14.99		83.50	
PR-292	2-20-23	Pl. 14 mo.	No	Aguirre	18.60	16.58		89.20	
PR-292	3-21-23	Pl. 15 mo.	No	Aguirre	18.90	14.91		79.00	
PR-292	4-16-23	Pl. 16 mo.	No	Aguirre	17.85	13.86		74.90	
					Tns. Cane per acre		Tns. Sugar per acre		
PR-292	3-21-24	Pl. 22 mo.	No	14.92	Hatillo	15.87	1.71	87.10	
Rayada	3-21-24	Pl. 22 mo.	No	6.56	Hatillo	16.67	0.80	88.20	

Certainly worthy of further trial and has been planted out at the Station in tonnage plots in comparison with the other P.R. canes and with B.H.-10(12) for a check. At present is looking exceptionally well. Earle reports it as susceptible to *Phyllosticta sacchari* leaf spot (det. Matz) in Aguirre.

\* PR-308.

Parents unknown.

Erect or at length procumbent, good vigor and stooling, arrows occasionally. Stalks long, medium diameter, green with a strong reddish flush, little bloom. Internodes medium length, conspicuously enlarged below, only slightly staggered, furrow usually none. Nodes scarcely constricted, oblique; growth ring broad, 2 to 4 mm., elevated but with a depressed line in center, dark green; root band strongly oblique, 6 to 10 mm. tapering downward the base constricted, concolorous; rudimentary roots large but inconspicuous, in about 3 rows; leaf scar glabrous, appressed behind; glaucous band 8 or 9 mm., not constricted, well defined. Buds broadly ovate or semi-orbicular but a little broader than long, about  $12 \times 10$  mm., scarcely exceeding the growth ring, margin broad, broader below but hardly shouldered, germination subdorsal, basal plaes short, with a scanty marginal but usually rather pronounced apical vestiture. Leaf sheaths with a heavy vestiture of long, coarse hairs, green or slightly tinted, glaucous, stained with purple at base within; throat densely lanate, extending in lines up the base of the leaf blade, and with an abundant vestiture of medium short hairs on the margins and behind the ligule; collar narrow reaching the midrib, glaucous, the margins heavily lanate; ligule short, 2 or 3 mm., the margin jagged and somewhat ciliate; ligular processes one usually developed but small and obtuse. Leaf blades erect except the tips, somewhat plicate and revolute, broad, 8 or 9 cm., dark green, sharply serrulate to the base, not ciliate.

This is a good vigorous high-tonnage cane, but it should only be planted in low lands. It does not do well on the red shale hills. It is rather late in ripening, so is best planted in the fall, but it may be planted in the spring if not cut under 12 or 13 months. It can be carried over successfully for long crop, or *caña quedada*, as it keeps well in the field and is not much eaten by rats. Its disease resistance has not been fully tested.

It is low in sucrose when green but develops a good percentage at full maturity. The last analysis given for 1921 was the highest sucrose found in any variety so far that year.



Kind	Date	Age	Arr.	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
PR-308	4-23-13	Pl			18.9	17.41		92.1	
PR-308	5-5-16				21.5	20.00		98.02	
PR-308	1-25-17				20.75	19.50		91.56	
PR-308	Apr. 1918	Pl. 11 mo.			16.40	18.01		79.32	
PR-308	6-1-18	Pl. 18 mo.			18.90	17.06		93.12	
PR-308	4-29-19	Rat. 11 mo.		56.0	19.70	18.21		92.43	
PR-308	1-8-20	Rat. 14 mo.		62.92	17.42	15.15		86.96	
PR-308	Apr. 1920	Rat. 11 mo.		68.46	20.31	18.96		88.92	
PR-308	1-8-20	Rat. 8 mo.		65.85	13.89	9.71		86.90	
PR-308	12-13-20	Rat. 10 mo.		75.0	13.73	11.88	3.15	82.95	9.00
Rayada	12-13-20	Rat. 10 mo.	No	71.1	15.83	13.45	1.76	84.96	8.08
PR-308	2-28-21	Pl. 16 mo.	No	70.8	17.90	15.80	0.88	88.28	12.84
Rayada	2-28-21	Pl. 16 mo.	No	63.6	17.15	15.25	0.81	88.92	12.87
PR-308	5-5-21	Pl. 18 mo.	No	60.7	21.0	19.94	0.191	94.95	
PR-308	6-7-24	Pl. 11 mo.	No	Hatillo	19.60	17.66	0.97	90.10	
BH (12)	6-7-24	Pl. 11 mo.	No	Hatillo	19.20	16.82	0.80	87.60	
PR-308	6-7-24	Rat. 11 mo.	No	Hatillo	19.40	17.89	0.67	89.63	
PR-308	6-7-24	Pl. 21 mo.	No	Hatillo	21.50	19.45	0.46	90.47	
PR-308	3-2-25	Pl. 20 mo.	No	Hatillo	17.05	15.22	0.57	89.27	
BH 10 (12)	3-2-25	Pl. 20 mo.	No	Hatillo	17.70	15.93	1.13	90.00	
PR-308	5-14-26	Pl. 14 mo.	No	Hatillo	20.00	18.23	0.19	91.15	
BH 10 (12)	5-14-26	Pl. 14 mo.	No	Hatillo	18.85	16.80	0.35	89.12	
					Tns. Cane per acre		Tns. Sugar per acre		
PR-308	5-11-26	Pl. 14 mo.	No	23.7	Hatillo	17.15	3.07	80.00	
BH 10 (12)	5-14-26	Pl. 14 mo.	No	21.8	Hatillo	17.90	2.92	89.36	

This is quite a good record and it is being further tried.

\* PR-309.

Parent unknown.

Erect, then declined, vigorous, medium stooler, seldom arrows. Stalks long, medium diameter, bright green, sometimes with a pink flush, no bloom. Internodes medium length, larger below, somewhat staggered, furrow slight and poorly defined or none. Nodes prominent, not constricted, nearly rectangular; growth ring about 2 mm., enlarged, the thickest part of the stalk, concolorous or brownish; root band 8 to 10 mm., tapering downward, concolorous; rudimentary roots large, distant, in about 3 rows; leaf scar at first lannate below the bud, appressed behind; glaucous band about 6 to 8 mm. tapering downward. Buds, oval, small, about  $8 \times 9$  mm., not exceeding the root band, margin narrow, uniform, germination dorsal or subdorsal, nearly glabrous, basal places greatly reduced but extending well up on the sides. Leaf sheaths with a dense vestiture of long stiff, assurgent hairs, green or tinted, slightly glaucous, stained with purple at base within; throat densely lannate and with an abundant vestiture of medium long hairs on margins and behind ligule; collar narrow, reaching the midrib, lannate; ligule narrow, 2 or 3 mm., entire; ligular processes none. Leaf blades erect except the tips, flat, about 7 cm., dark green, minutely serrulate, the base nearly even, not ciliate.

A vigorous cane of high tonnage but best adapted to low lands.



It is late in maturing and should only be planted in the fall. Its disease resistance has not been determined.

Its late maturity is indicated by the following analyses.

It should be tested for long crop or *caña quedada*:

Kind	Date	Age	Arr.	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
PR-309.....	4-25-13	Pl.....	.....	.....	15.5	12.61	.....	81.3	.....
PR-309.....	5-5-16	.....	.....	.....	17.0	14.60	.....	85.58	.....
PR-309.....	4-25-17	.....	.....	.....	18.55	16.00	.....	86.25	.....
PR-309.....	4-15-18	Pl 11 mo.....	.....	.....	16.85	13.12	.....	77.81	.....
PR-309.....	4-30-19	Rat. 12 mo.....	.....	57.6	17.90	15.30	.....	85.47	.....
PR-309.....	4-15-20	Rat. 11 mo.....	.....	71.42	17.59	14.51	.....	82.49	.....
PR-309 (1).....	1-8-20	Rat. 14 mo.....	.....	66.03	13.05	9.24	.....	70.80	.....
PR-309.....	12-13-20	Rat. 10 mo.....	.....	72.40	15.09	11.93	2.15	79.05	7.72
Rayada.....	12-13-20	Rat. 10 mo.....	No.....	71.10	15.83	13.45	1.75	84.96	8.08
PR-309.....	2-28-21	Pl. 16 mo.....	No.....	65.30	20.60	19.41	0.72	94.22	12.49
Rayada.....	2-28-21	Pl. 16 mo.....	No.....	63.60	17.15	15.25	0.81	82.92	12.37

(1) Lowest in sucrose out of 37 kinds.

#### \* PR-317.

##### Parents unknown.

Erect, at length declined, vigorous, good stooler, arrows frequently. Stalks long, medium diameter, green then yellowish with a reddish flush, little or no bloom. Internodes long, at first cylindrical, then somewhat ventricose on side opposite bud, somewhat staggered, furrow usually evident. Nodes somewhat constricted, more or less oblique; growth ring poorly defined, about 2 mm., concolorous or dull brownish; root band 9 to 12 mm., concolorous; rudimentary roots small, crowded, in 4 to 6 rows; leaf scar glabrous, appressed behind; glaucous band broad, 10 to 12 mm. somewhat constricted. Buds large, flat, narrowly ovate, pointed but not acute, about 12 × 15 mm., exceeding growth ring by one-third to one-half; margin broad, uniform, germination apical, basal plates well developed and extending up onto shoulders, marginal vestiture scanty. Leaf sheaths with a dense, coarse, strongly assurgent vestiture, green or tinted, glaucous, stained with purple at the base within; throat lannate and with a rather scanty vestiture of medium short hairs on the margins and behind the ligule; collar reaching the midrib, glaucous, the margins lannate; ligule rather narrow, abruptly widened to 4 mm., at center, minutely fimbriate; ligular processes one usually developed, small, obtuse. Leaf blades erect except the tips, somewhat plicate and revolute, about 7 cm. wide, minutely serrulate, the base even, not ciliate.

A sport with pink stripes was found by Earle and cultivated as X-64.

In the Santa Rita immunity experiment it proved more resistant than Rayada to root disease, but rather more susceptible to mosaic. It has not been tested for gum disease.

In the variety test on rich cow-penned land at Central Mercedita, Yabucoa, it made a good record, cut February, 1920, as plant cane of 17 months: tons cane per acre, 54.87; brix, 16.10; sucrose, 13.12; purity, 81.5; tons sugar, 5.089.

Kind	Date	Age	Arr.	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
P R-317.....	4-24-13	Pl.....	.....	.....	17.6	15.10	.....	85.8	.....
P R-317.....	5-5-16	.....	.....	.....	18.1	15.61	.....	86.24	.....
P R-317.....	1-15-17	.....	.....	.....	20.05	18.40	.....	91.77	.....
PR-317.....	2-12-18	Pl. 15 mo.....	.....	.....	11.70	8.21	.....	70.17	.....
PR-317.....	1-7-20	Rat. 14 mo.....	.....	61.53	17.17	14.78	.....	85.96	.....
Cristalina	1-7-20	Rat. 16 mo.....	.....	.....	.....	17.27	.....	.....	.....
P R-317.....	12-13-20	Rat. 10 mo.....	No.....	72.10	12.43	9.15	2.01	72.5	9.08
Cristalina	12-13-20	Rat. 10 mo.....	No.....	.....	.....	13.41	1.78	85.76	10.80
P R-317.....	12-22-20	Rat. 14 mo.....	No.....	65.80	15.60	12.89	1.74	82.62	9.36
P R-317.....	12-22-20	Rat. 14 mo.....	Yes.....	74.0	16.23	13.65	1.31	84.10	11.62
Cristalina	12-22-20	Rat. 14 mo.....	No.....	70.0	17.50	15.53	0.28	88.70	9.60
P R-317.....	3-3-21	Pl. 16 mo.....	No.....	71.4	16.85	13.35	1.04	79.22	11.44
Rayada.....	3-3-21	Pl. 16 mo.....	No.....	72.7	18.25	16.30	0.71	89.31	12.00
P R-317.....	5-5-21	Pl. 18 mo.....	No.....	64 b	20.00	18.81	0.433	94.60	.....
P R-317.....	1-18-23	Pl. 13 mo.....	No.....	.....	17.30	13.90	.....	80.40	.....
317.....	2-20-23	Pl. 14 mo.....	No.....	.....	16.10	11.66	.....	72.40	.....
317.....	3-21-23	Pl. 15 mo.....	No.....	.....	16.60	12.32	.....	74.30	.....

The last series of analyses is copied from Earle's Aguirre notes on this kind, where he decided it was of no value. The same conclusion is merited at the Station, where experiments with it have been discontinued.

\* **PR-318.**

Parents unknown.

Erect, at length declined, medium vigor and stooling, seldom arrows. Stalks medium stout, green then yellowish with a purplish-red flush, considerable bloom. Internodes medium to short, somewhat barrel shaped, staggered, furrow usually none. Nodes constricted, somewhat oblique; growth ring about 2 mm., usually a little elevated, yellowish brown then dark green; root band 6 to 9 mm., constricted, green; rudimentary roots medium size, crowded, greenish; leaf scar glabrous, appressed behind; glaucous band 10 mm., slightly constricted, well defined. Buds triangular-ovate, obtuse, often reddish, about 12 × 12 mm., slightly exceeding the growth ring, margin medium width, broader below but scarcely shouldered, germination sub-apical, basal plac well developed and extending up onto the shoulders, marginal and apical vestiture scanty. Leaf sheaths glabrous or nearly so, green or tinted, somewhat glaucous, stained with purple at base within; throat densely lannate and with abundant vestiture on margins and behind ligule; densely lannate throughout; ligule about 3 mm., fimbriate; ligular processes usually one developed, short, 6 to 8 mm., obtuse. Leaf blades erect except the tips, flat, broad, 8 to 9 cm., serrulate to the base, not ciliate.

In the Santa Rita immunity experiment its record was fair, being a little better than Rayada as regards root disease and about the same in susceptibility to mosaic. It has not been tested for gum disease.

In the variety tests on cow-penned land at Central Mercedita, Yabucoa, it gave the poorest tonnage out of the eight kinds tested; tons cane per acre, 30.73; brix, 17.10; sucrose, 13.74; purity, 82.6:

Kind	Date	Age	Arr.	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
PR-318 .....	4-25-13	Pl. ....			19.4	17.64		90.9	
PR-318 .....	5-5-16				18.7	17.02		91.01	
PR-318 .....	4-25-17				22.15	20.60		93.00	
PR-318 (i) .....	2-12-18	Pl. 16 mo. ....			19.70	17.80		90.31	
PR-318 .....	12-13-20	Rat. 10 mo. ....	No.	71.1	15.66	12.22	2.32	78.03	8.09
Rayada .....	12-13-20	Rat. 10 mo. ....	No.	71.1	15.83	13.45	1.76	84.96	8.08
PR-318 .....	12-22-20	Rat. 14 mo. ....	No.	69.0	17.73	15.85	0.84	89.39	12.40
Cristalina .....	12-22-20	Rat. 14 mo. ....	No.	70.0	17.50	15.53	0.28	88.74	9.60
PR-318 .....	1-26-21	Rat. 15 mo. ....	No.	70.5	17.95	15.85	0.73	88.30	12.98
Cristalina .....	1-26-21	Rat. 15 mo. ....	No.	70.3	17.85	16.14	0.33	90.42	10.69
PR-318 .....	5-5-21	Pl. ....	No.	67.1	19.10	17.73	0.70	92.82	

(1) First in sucrose out of 20 kinds.

Planted out at the Station in the fall of 1924, in comparison with P.R.-270, 292 and 358, it made such an inferior showing to these kinds in germination, stooling, girth and general development that it was decided by Mr. Luis Serrano, the Assistant Agronomist, and the author, to definitely abandon this variety in further experiments.

### THE PORTO RICO SEEDLINGS PRODUCED IN 1913

\*PR-328. See Plate V, opposite page 239.

#### Seedling of B-3412.

Erect, later semi-recumbent, good vigor, fair stooler, arrows early and freely. Stalks long, medium girth, dark pink, changing to red on exposure, heavy bloom. Internodes long, cylindrical, with a decided shoulder on side opposite bud, slightly staggered. furrow distinct, narrow and flat. Nodes prominently enlarged, at right angle to stalk; growth ring broad, 6-10 mm., very prominently elevated, brown; root band parallel, light green, changing to pinkish on exposure; rudimentary roots not crowded, purple, 2-4 in rows; leaf scar glabrate, broad and prominent in front and appressed behind; glaucous band constricted and well defined. Buds large, about 14 by 16 mm., suborbicular, barely exceeding growth ring, margins broad and uniform, germination apical, light basal places, neither marginal vestiture nor conspicuous apical tuft. Leaf sheaths with dense vestiture along back, sides glabrate, greenish or slightly tinted, somewhat glaucous, inner base heavily stained with purple; throat lannate and with an abundant vestiture of long hairs; collar

medium width, reaching midrib, glaucous; ligule 3 by 6 mm., nearly even; ligular process none. Leaf blades erect with declining tips, flat, 7 by 9 cms., dark green, minutely and uniformly serrulated, no basal ciliation.

One of the more promising of this series of canes. The following analyses of it have been made:

### ANALYSES IN THE INSULAR STATION

#### Analyses in the Insular Station

Plant. IX-13-14	Brix. 20.42;	Suc. 18.65;	Purl. 91.33 (laborat.)
IV-5-16	20.8	18.75	90.14
IV-25-19	17.63	14.87	84.05 (Central)
V-27-18	19.71	18.20	92.34 (laborat.)

#### Second in sucrose of 20 var. Cristalina first

III-18-21 (18 mos.)	Brix. 20.30;	Suc. 18.34;	Purl. 90.34 (laborat.)
Cristalina	21.18	19.44	91.78 (laborat.)
8 mos. ratoons I-10-20, Extr. 66.20	17.36	14.68	85.56 (laborat.)
Cristalina	16.31		(laborat.)
Ratoons-11 mos. Mar., 1920, 69.23	19.79	17.39	87.87 (laborat.)

#### Third in Suc.; 7th in Pur. of 15 var.

V-13-20,	64.66	21.65	17.70	81.71 (laborat.)
Cristalina			20.46	90.85 (laborat.)
Plant. 12 mos. April, 1920,	66.66	20.12	18.23	90.60 (laborat.)

#### 9th in Suc.; 11th in Pur. of 25 var.

10 mos. May 3, '21,	64.7	16.80	13.68	81.42 (laborat.)
Cristalina	70.5	18.00	16.28	90.44 (laborat.)
11 mos. IV-1-21,	73.2	19.25	16.30	84.67 (laborat.)
Cristalina	69.2	18.30	17.15	93.71 (laborat.)

#### Analyses in Central Aguirre-Plant

I-16-23,	20.30	17.78	87.6 (laborat.)
II-20-23	19.60	17.04	87.0 (laborat.)
III-23-23	20.90	18.76	89.7 (laborat.)
IV-16-23	18.85	14.59	77.4 (laborat.)

#### Analyses of plant in Insular Station

IV-5-22,	69.23	19.94	18.61	93.33 (laborat.)
Cristalina	63.63	18.61	17.22	92.50 (laborat.)

#### Tonnage Expt. at Station ground at Central Vannina.

G. C. 16 mos. II-9-23,	50.15 Tns. Cane p. a.	Brix 16.30, Suc. 13.40, Purity 82.20, Tns. Sug. p. a. 4.83
B. H. 10 (12), -II-9-23,	54.81 Tns. Cane p. a.	Brix 17.43, Suc. 15.00, Purity 86.05, Tns. Sug. p. a. 6.05

In the tonnage test in comparison with B.H.-10(12) and fourteen others of our most promising canes, P.R.-328 stood seventh in sucrose content and fifth in production of sugar per acre, being passed in the latter respect only by P.R.-460, B.H.-10(12), Badilla and D-1135.

#### PR-329.

Seedlings of B-3412. One of the dwarf type of cane, producing heavy tonnage and having good sugar content. Evidently a *vega* cane. Is a good ratooner. Earle considers it of no value on the South Coast.

Erect, good vigor, fair stooler, arrows fairly freely. Stalks long, stout, yellowish green changing to red and then to purplish brown abundant bloom when young. Internodes short, cylindrical, in



straight line; furrows distinct but very shallow. Nodes even, at right angle to stalk; growth ring medium width, even, greenish brown, becoming concolorous with age; root band parallel, 6-10 mm., concolorous; rudimentary roots few and scattered, 2-3 in rows, concolorous; leaf scar ciliated, broad and prominent in front and appressed behind; glaucous band constricted and well defined. Buds large,  $14 \times 18$  mm., lanceolate, exceeding growth ring by one-half, heavy marginal vestiture of long hairs, distinct apical tuft, germination apical, heavy basal plac. Leaf sheaths with light vestiture at back, sides glabrate, greenish and slightly tinted, glaucous, inner base lightly stained with purple; throat laminate, with short appressed hairs; collar wide reaching midrib, laminate; ligule about 4 mm. wide, nearly even; ligular process small, broad and inconspicuous, on one side only. Leaf blades spreading with tips well declined, flat, 8-10 cms., wide, dark green, distinctly striated, very minutely but uniformly serrulated at margins, long straggling hairs at base.

The following analyses have been made:

Age	Date	Briz.	Suc.	Pur.	Mill.	Extrac.
Plant	IX-13-14	19.42	17.55	90.37	Lab.	
	IV 5-16	19.50	17.51	89.76	Lab.	
	IV 5-19	16.10	14.12	86.09	Cent.	58.3
	V-27-18	19.02	17.80	90.96	Lab.	(3rd in Suc. of 20 Var.)
1st. Ratoons	III 20	19.79	17.27	87.26	Lab.	68.0 (4th. in Suc. of 15 Var.)
	V-18-20	20.15	17.85	86.10	Lab.	58.78 (13 mos.)
Cristalina			20.46	90.85	Lab.	
Plant	IV-20	20.62	18.40	89.78	Lab.	71.05 (12 mos.) 8th of 25 Var.
	V-20	17.15	18.68	79.76	Lab.	71.10 (10 mos.) Fibre 11.6
Cristalina		18.00	16.28	90.41	Lab.	70.50 10.6
Plant	IV-25-21	16.55	13.44	81.20	Lab.	62.20 (11 mos.) 12.1
Cristalina		18.30	17.15	93.71	Lab.	69.20 12.3
Plant in Central Aguirre, 1923						
	I-18	19.80	16.59	85.50	Lab.	Earle states that this variety
	II-23	18.30	15.51	81.90	Lab.	is probably of no value on
	III-21	18.20	15.65	86.00	Lab.	South Coast.
Plant	IV-5-22	20.41	18.40	90.15	Lab.	71.77 Red. Sug. 1.079
Cristalina		18.61	17.22	92.50	Lab.	68.68 0.697

#### Tonnage Experiment at Insular Experiment Station

G. C. 16 mos.—II-9-26—40.50 tons cane per acre (Stood 10th out of 16 varieties)  
 BH-10(1)—II-9-26—54.81 tons cane per acre. (Stood 4th out of 16 varieties)

#### Striped Sports of PR\*329.

Mr. Luis Serrano has found and bred true to type in the station two distinct stripped sports of P.R.-329, one a green stripe on a red ground and the other a yellow stripe on the red ground. In everything but color these sports are typical of the P.R.-329, but comparative experiments with them should be carried on to determine if their chemical qualities may or may not have changed with their color mutation.



**PR-358.** See Plate V, opposite page 239; also Plate XXVI, opposite page 249.

Seedling of Trinidad 77. It is remarkable that a variety of such distinct parentage could be so similar to P.R.-328. Earle considers that it has no value on the South Coast. It suffers considerably from the root disease complex.

Erect, at length recumbent, good vigor, fair stooler, arrows freely. Stalks long, medium girth, dark pink changing to red on exposure, heavy bloom. Internodes long, cylindrical, lower joints inclined to tumidity with occasional shoulder at bottom end opposite but, slightly staggered; furrow distinct, medium width and shallow. Nodes constricted, at right angle to stalk; growth ring broad, very prominently elevated brown; root band parallel, 6-10 mm., light green changing to purplish on exposure; rudimentary roots fairly crowded, 3-4 in rows, purple; leaf scar glabrate, broad and prominent in front and appressed behind; glaucous band constricted and well defined. Buds large, about  $12 \times 16$  mms., lanceolate, exceeding growth ring by one-third, heavy marginal vestiture of long hairs, germination apical, heavy basal placs. Leaf sheaths with light vestiture of long hairs at back, sides glabrate, greenish or slightly tinted; slightly glaucous base and heavily stained with purple within; throat with short appressed hairs, broad and well defined; collar medium width, reaching midrib, covered with short wooly hairs; ligule 3-6 mms., nearly even; ligular process none. Leaf blades erect with declining tips, flat, wide, 8-10 cms., dark green, minutely and uniformly serrulated, margins near base with long straggling hairs.

The following analyses have been made:

Location	Date	Age.	Mill	Tns. cane per acre	Brix.	Sucr.	Purity	Remarks
Ins. Expt. Sta.	5-27-18	Plant. ....	Hand	.....	18.27	16.09	87.02	9th of 20 var.
Ins. Expt. Sta.	1-10-20	1st 8 mo.	Hand	.....	16.06	12.56	78.20	12th of 17 var.
Ins. Expt. Sta.	3-14-21	18 mos ..	Hand	.....	18.45	16.03	86.87	Fiber 12-60
Cristalina...	3-14-21	18 mos ..	Hand	.....	21.18	19.44	91.78	Fiber 13-00
Ins. Expt. Sta.	Mar 1920	Rat. 11 ms.	Hand	.....	18.22	16.79	92.15	6th in suc of 15 v.
Ins. Expt. Sta.	5-13-20	Rat 13 ms	Hand	.....	20.35	17.00	83.98	.....
Cristalina...	5-13-20	Pl. 13 mos.	Hand	.....	.....	20.46	90.85	.....
Ins. Expt. Sta.	Apr. 20	Pl. 13 mos.	Hand	.....	19.01	17.30	91.00	16th in suc. of 20 v.
Ins. Expt. Sta.	3-23-21	Pl. 10 mos.	Hand	.....	17.65	15.90	90.08	Fiber 11-56
Cristalina...	3-23-21	Pl. 10 mos.	Hand	.....	18.00	16.28	90.44	Fiber 10-62
Ins. Expt. Sta.	4-25-21	Pl. 11 mos.	Hand	.....	18.45	14.47	89.21	Fiber 12-68
Cristalina...	4-25-21	Pl. 11 mos.	Hand	.....	18.30	17.15	93.71	Fiber 12-32
Cent. Aguirre..	1-18-23	Pl. 13 mos.	Hand	.....	18.15	14.76	81.30	.....
Cent. Aguirre..	2-23-23	Pl. 14 mos.	Hand	.....	18.10	14.53	80.40	Sound and ripe
Cent. Aguirre..	3-21-23	Pl. 15 mos.	Hand	.....	17.40	14.25	81.90	Mostly rotten
Ins. Expt. Sta.	4-5-22	Pl. 12 mos.	Hand	.....	19.01	17.01	89.47	Gluc 0.906
Cristalina...	4-5-22	Pl. 12 mos.	Hand	.....	18.61	17.22	92.50	Gluc 0.632
Ins. Expt. Sta.	2-9-26	Pl. 16 mos.	Cent.	61.48	12.15	8.69	71.52	3.50 tns. sug. per a.
B. H. 10 (12)...	2-9-26	Pl. 16 mos.	Cent.	54.81	17.43	15.00	86.06	6.05 tns. sug. per a.

A variety of very little promise indeed.

**PR-383.**

A cross between Otaheite and *D-117*. Shows the latter parentage very strongly. The author, upon his arrival at the Station in 1923, found that the stand of this variety had been lost, but was able to secure some seed from Mr. W. C. Dreier, manager of the Hatillo Fruit Co., along with P.R.-208, 308, 472 and 502. Of all of these the P.R.-383 germinated the worst and in general it is not a promising looking cane.

Recumbent, fair vigor, good stooler, very susceptible to mosaic. Stalks long and fair girth, green to yellow, no flush no bloom. Internodes medium to long, cylindrical, not staggered, furrow traces to none. Nodes oblique, nearly even; growth ring narrow, 2-4 mms., inconspicuous, even, concolorous; root band narrow, oblique, concolorous; rudimentary roots small, numerous and scattered, 3-5 in rows, concolorous; leaf scar glabrate and appressed behind; glaucous band broad, slightly constricted and conspicuous. Buds small to medium size, 6-8 mms., not exceeding growth ring, suborbicular, germination apical, margins very narrow and scanty lannated, shouldering at base, light basal places, decided tendency to premature sprouting. Leaf sheaths with scanty dorsal vestiture of white hairs, sides glabrate, green with inner base tinted, glaucous; throat broad, well defined, lannate with short appressed hairs and few long straggling hairs at margins; collar very broad and dark, reaching midrib, glaucous; ligule narrow, 2-4 mms. at sides, but abruptly enlarged at center, where lower margin is concave and upper even; ligular process similar to that of its parent, *D-117*, long and on one side only. Leaf blades spreading with declining tips, medium width, about 6 cms., light green, uniformly serrated and ciliated at base.

The following few analyses are on record at the Station:

Age	Extract.	Brix	Sucrose	Glucose	Purity	Fiber	Date
18 mths.	70.5	18.75	16.37	1.29	87.30	11.80	III-14-21
Cristalina	67.5	21.18	19.44	0.40	91.78	13.00	III-14-21
19 mths.	60.0	20.10	18.57	0.55	92.38	12.80	IV-27-21
17 mths.	66.6	19.29	17.40	0.51	90.20	.....	V-9-21
12 mths.	70.73	18.51	16.73	.....	91.19	.....	April, 1920

(In this test, 18th in sucrose out of 25 varieties.)

### THE PORTO RICO SEEDLINGS PRODUCED IN 1914

**PR-417.**

Parentage unknown. Agricultural Agent J. Quiñones Ruiz wrote us from Jayuya under date of 23rd February, 1924:

"PR-417 germinates later than B-3412, but is more resistant to mosaic disease, although we have rogued it also and there are some infected stools still. It is a poor ratooner."

Here at the Station it has shown a fair tonnage and holds its condition well once it has matured. Subinspector of Agriculture Rafael Bermúdez reports, in Circular 7 of the Department of Agriculture, a yield of 20 tons per acre from this cane at Guayama, cut at seven months for seed, in comparison with 30 tons for B-3412. It does not give much promise, although Bermúdez reports it resistant to borer.

Erect, at length recumbent, good vigor, arrows freely. Stalks long, medium diameter, basic color yellowish green, becoming reddish tint to dirty purple, very slight bloom. Internodes medium length, constricted and broad at base, very slightly staggered, furrow occasional or none. Nodes constricted, at right angle to stalks; growth ring wide and prominent, yellowish brown changing to purple; root band parallel, wide, 6-10 mms., light yellow changing to dark green and purple; rudimentary roots inconspicuous, few and scattered, 2-3 in rows, concolorous; leaf scar glabrate, broad and prominent in front and appressed behind; glaucous band constricted and well defined. Buds small,  $10 \times 14$  mms., scarcely exceeding growth ring, margins glabrate, suborbicular, glabrate and fairly wide, no apical tuft, germination apical, light basal places. Leaf sheaths with abundant dorsal vestiture, sides glabrate, purple, glaucous, heavy coating of wax, heavily stained with purple within; throat lannate, long tufts at margins; collar wide, reaching midrib, glaucous; ligule narrow, 2-4 mms., nearly even; ligular process none. Leaf blades erect with declining tips, flat, rather narrow, 5-7 cms., midrib purplish, rest of leaf light green with occasional purple shading, margins minutely and uniformly serrulated, long, straggling hairs at base.

The following analyses have been made, all but the last two being from juices extracted in laboratory mills. The penultimate analysis is from cane ground at Central Triunfo and the last at Central Vanina.

## ANALYSES IN INSULAR EXPERIMENTAL STATION PLANT

Date	Brix	Sucr.	Purity	Extr.	Gluc.	Fibre
VI-1-15	17.40	15.26	87.70			
V-8-16	20.00	18.04	90.20			
IV-24-19	18.60	16.60	89.24	55.0		
III-18-21	19.20	16.75	82.03	67.7	1.060	9.44 (18 mos.)
Cristalina	21.18	19.44	91.78	67.5	0.398	13.00
V-9-21	19.09	16.72	87.58	68.7	1.060	(17 mos.)
XI-1-20	19.55	17.39	88.95	65.5	0.870	12.02 (13 mos.)
Cristalina	19.30	18.33	94.92	68.9	0.197	11.55
VI-5-20	18.89	16.51	87.40	50.0	(19th in Sucr. and Pur.	
V-18-20	19.92	17.55	88.10	60.00	of 25 vs.)	
IV-27-21	17.30	12.69	73.35	61.9	2.990	12.19 (11 mos.)
Cristalina	18.30	17.15	93.71	69.2	0.290	12.32

## ANALYSES IN CENTRAL AGUIRRE PLANT

I-8-23	18.65	15.86	85.10	(12 mths.)
II-23-23	19.60	16.69	85.10	(14 mths.)
III-21-23	20.30	18.07	88.90	(15 mths.)
1925	17.6	15.30	86.94	(Reported by Agr. Agt Díaz, without age)
V-27-26	18.95	16.70	88.10	(13 mo. rat.) Gave 28.4 tons. cane per acre
B-3412	16.05	12.72	79.25	(12 mo. rat.) Gave 21.0 tons. cane per acre

## PR-422.

Parents unknown. An exceptionally good germinator, which is resisting very unfavorable hillside conditions at the Hatillo Fruit Company Farm near the Station, being far ahead of PR-328 and 358 in this respect.

Erect, fair vigor, arrows early and prolifically. Stalks long, medium diameter, yellow, almost no bloom. Internodes medium length, cylindrical to slightly tumid, very slightly staggered, no furrow. Nodes slightly constricted at base, at right angle to stalk; growth ring wide and prominent, red becoming concolorous with age; root band oblique, medium width, 5-8 mms., narrowing towards back, concolorous; rudimentary roots inconspicuous, few and scattered, 2-4 in rows, concolorous; leaf scar glabrate, broad and prominent in front and appressed behind; glaucous band constricted and well defined. Buds large,  $12 \times 16$  mms., exceeding growth ring by one-third, suborbicular, wide margins with heavy vestiture and distinct apical tuft of long hairs, germination apical, basal places covered with short, wooly hairs. Leaf sheaths lannate abundantly at back, sides glabrate, green with purple margins at sides and base, glaucous, stained with red at base within; throat lannate, with long straggling hairs; collar medium width, reaching midrib and of distinct dark gray color, glaucous; ligule narrow, 2-4 mms., nearly even; ligular process none. Leaf blades spreading and rather erect



tips, flat, medium width, 6-8 cms. dark green, margins minutely but distinctly serrulated, ciliated near base.

The following analyses of juices obtained through the laboratory mill at the Station have been made, all but the last one being from Station plats. The last analysis is from nine-months plant cane sent from the Hatillo Fruit Co. Farm:

Date	Age	Tns. Cane p. acre	Extra.	Brix	Sucr.	Gluc.	Purity
V-27-18 .....	Plant .....	15.12	.....	19.47	17.20	.....	88.34
IV-8-21 .....	17 mo. ....	.....	60.3	19.85	18.13	0.432	91.34
I-12-20 .....	R. 8 mo. ....	.....	47.8	18.31	15.94	.....	87.05
Mar., 20 .....	R. 11 mo. ....	.....	55.6	19.92	17.92	.....	89.95
V-13-20 .....	R. 13 mo. ....	.....	55.6	21.65	19.81	.....	91.50
Cristalina .....	R. 13 mo. ....	.....	.....	.....	20.46	.....	90.85
XII-11-20 .....	9 mo. ....	.....	.....	15.15	11.64	.....	76.83

**PR-430.**

Parents unknown. Earle reports it from Aguirre as of no value and thinks it should be exterminated.

Erect, at length recumbent, very good vigor, good stooler, arrows early and prolifically. Stalks long, rather slender, green, some bloom. Internodes long, larger below, shouldered at base opposite bud, decided tendency to split, very distinctly staggered, furrow trace to none. Nodes constricted, oblique: growth ring wide and prominent, brown changing to concolorous; root band oblique, wide, 6-10 mms., yellow to green: rudimentary roots inconspicuous, few and scattered, 2-3 in rows, concolorous; leaf scar glabrous, broad and prominent in front and appressed behind; glaucous band constricted and well defined. Buds rather large, at first not exceeding growth ring but later extending, broadly ovate, germination apical: narrow margins with little vestiture, inconspicuous basal plac. Leaf sheaths with scanty vestiture of short hairs at back, sides glabrate, green, glaucous; throat lannate, with long straggling hairs; collar wide, reaching midrib, distinct dark gray color, glaucous; ligule narrow, 2-4 mms., nearly even; ligular process none. Leaf blades spreading with declining tips, wide, 10-12 cms., dark green, margins hardly serrulated, almost glabrate at base.

The following analyses have been made, all but the last two being from cane grown on Station or Aguirre plats and ground in the laboratory mill. The last two analyses are of commercial quantities of cane from the Hatillo Fruit Co. Farm near the Station, ground at Central Victoria, Carolina.



Date	Age	Location	Extrac.	Brix	Sucr.	Glucos.	Purity	Tns. Cane p. Acre
V-27-18	Plant	Ins. Sta.		16.96	14.80		87.26	
III-21-21	18 mo.	Ins. Sta.	68.70	18.50	15.87	1.65	85.78	Fib.-11.26
Cristalina	18 mo.	Ins. Sta.	67.50	21.18	19.44	0.40	91.78	Fib.-13.00
V-10-21	17 mo.	Ins. Sta.	62.00	17.69	15.12	1.18	86.08	
I-12-20	R 8 mo.	Ins. Sta.	63.00	15.09	11.93		79.06	
Mar., 20	R 11 mo.	Ins. Sta.	67.31	18.62	16.17		88.15	
V-13-20	R 13 mo.	Ins. Sta.	62.50	20.15	17.61		86.06	
Cristalina	R 13 mo.	Ins. Sta.			20.46		90.85	
Apr. 20	P 12 mo.	Ins. Sta.	56.52	20.08	17.85		88.62	
III-28-21	10 mo.	Ins. Sta.	61.40	15.70	12.20	11.53	73.05	Fib.-12.35
Cristalina	10 mo.	Ins. Sta.	70.50	18.01	16.28	0.65	90.44	Fib.-10.62
IV-25-21	11 mo.	Ins. Sta.	67.10	16.80	13.49	1.68	80.23	Fib.-11.88
Cristalina	11 mo.	Ins. Sta.	69.20	18.30	17.15	2.90	93.71	Fib.-12.32
I-18-23	13 mo.	Aguirre		16.20	12.33		76.10	
IV-6-22	12 mo.	Ins. Sta.	70.86	16.73	13.74	1.77	82.12	
Cristalina	12 mo.	Ins. Sta.	63.63	18.61	17.22	0.70	92.60	
III-21-24	19 mo.	Hatillo			16.04		86.10	34.5
Rayada	19 mo.	Hatillo			16.51		91.00	22.2

## PR-431.

Parentage unknown.

Recumbent, good vigor, fair stooler. Stalks long, medium diameter, pinkish red, heavy bloom. Internodes medium length, slightly tumid, slightly staggered, furrow traces to none. Nodes constricted, oblique; growth ring wide and prominent, narrowing towards front, yellowish green; root band parallel, wide, 5-9 mms., yellow changing to purple; rudimentary roots inconspicuous, few and scattered, 3-4 in rows, light purple to concolorous; leaf scar glabrous and appressed; glaucous band constricted and fairly well defined. Buds medium size, scarcely exceeding growth ring, orbicular, germination subapical, narrow margins covered with very short appressed hairs, apical tufts of very short hairs, inconspicuous basal places of short white hairs. Leaf sheaths with scanty vestiture of short hairs at back, sides glabrate, green changing to purple on lower leaves, glaucous; throat lannate with abundant long hairs; collar wide, reaching midrib, glaucous; ligule narrow, 2-4 mms., nearly even; short ligular process, 1-2 cms., on one side only. Leaf blades spreading with declining tips, narrow, 4-6 cms., light green, tendency to purplish tint in midribs, margins ciliated and minutely but uniformly serrulated, base provided with long straggling hairs.

The following analyses have been made from extractions in Station laboratory mill. All samples except the last, which is from Hatillo Fruit Farm, are from Stations plats:

Date	Age	Extra.	Brix	Sucr.	Gluc.	Purity	Fiber
V-10-21	17 mo.	60.0	17.13	15.20	0.934	88.73	
I-12-20	R 8 mo.	60.9	15.56	12.52		80.46	
Mar., 20	R 11 mo.	60.5	17.58	15.64		88.96	
V-13-20	R 11 mo.	64.0	21.35	19.14		89.64	
V-13-20	R 11 mo.			20.46		90.85	
IV-28-24	3rd Rat.	59.8	17.65	15.58		88.27	
	21 mths						

**PR-433.** See Plate V, opposite page 239.

Parentage unknown. Very similar in general appearance to PR-492, but lacks the long apical tuft on bud of latter. This is one of the most promising of the Porto Rican seedlings. At the Station it has done consistently well and plantings out on the Island have generally shown up good. On a visit with Mr. R. Menéndez Ramos, formerly Director of the Station, to the *finca* of Don Páco Solá in October, 1924, this variety was amongst the best of those growing on a patch of poor hillside land, which lot included SC-12/4, BH-10(12), D-1135, etc.

Erect, good vigor, good stooler, early and heavy arrower. Stalks long, medium girth, green changing to yellow, no flush, some bloom. Internodes of medium length and width, slightly tumid at base opposite bud, at right angles to stalks; furrow very broad and shallow. Nodes even and parallel; growth ring narrow but prominent, red to concolorous; root band parallel, wide, 6-10 mms., concolorous; rudimentary roots inconspicuous but crowded, 3-4 in rows, concolorous; leaf scar glabrous, broad and prominent in front and appressed behind; glaucous band constricted and conspicuous. Buds rather large, exceeding growth ring, ovate to suborbicular, germination apical; wide margins covered with short, appressed hairs, light apical tuft of short hairs; inconspicuous basal plac. Leaf sheaths glabrate, green tinted with purple; inner base heavily stained with purple; sheath slightly glaucous; throat lannate, with long tufts of hairs; collar broad, reaching midrib, glaucous; ligule rather wide, 3-5 mms., nearly even; ligular process none. Leaf blades spreading with declining tips, rather narrow, 5-6 cms., light green, margins minutely and uniformly serrulated, base slightly ciliated.

In December, 1924, on a gently sloping hillside of red clay at the Hatillo Fruit Farm, it was as first ratoons, the outstandingly best of some ten varieties, mostly Porto Rico seedlings. While PR-333 had been superior as plant cane, PR-433 passed it as first ratoons. Mr. Brebner, Agriculturist at Central Aguirre, reported to the writer a yield of 65 tons per acre from this variety early in January, 1925. Rafael Bermúdez, Subinspector of Agriculture at Guayama, reports in Circular 7 of the local Department of Agriculture that it was one of the best of the Porto Rico seedlings tried out there. He said:

"Although its tonnage yield was a bit low, compared with the other varieties, it is one of the most promising canes on account of its closing quickly and its excellent general development. Another advantage of this variety is that the leaves drop as soon as they are dry. This characteristic makes its harvesting more economical."

The following analyses have been made:

Location	Date	Age	Mill	Tns. Cane p. acre	Brix	Sucr.	Purity	Remarks
Ins. Sta.....	V-27-18	Plant....	Lab.	14.14	15.55	11.20	72.02	18th out of 20
Ins. Sta.....	III-18-21	18 mos...	Lab.	Fib. 11.81	20.91	19.37	92.15	Glucose 0.457
Cristalina....	III-18-21	18 mos...	Lab.	Fib 13.00	21.18	19.44	91.78	Glucose 0.898
Ins. Sta.....	Apr., 1920	12 mos....	Lab.	.....	21.18	19.64	92.12	2nd out of 25
Ins. Sta.....	V-18-20	18 mos....	Lab.	.....	21.92	19.90	90.81	.....
Ins. Sta.....	III-28-21	10 mos....	Lab.	Fib. 12.42	18.70	16.49	90.58	Glucose 0.65
Cristalina....	III-28-21	10 mos....	Lab.	Fib. 10.62	18.00	16.28	90.44	Glucose 0.65
Ins. Sta.....	IV-27-21	11 mos....	Lab.	Fib. 13.22	18.90	16.98	89.84	Glucose 1.01
Cristalina....	IV-27-21	11 mos....	Lab.	Fib. 12.32	18.30	17.15	88.71	Glucose 2.90
Ins. Sta.....	IV-5-22	12 mos....	Lab.	.....	18.84	17.80	91.80	Glucose 0.59
Cristalina....	IV-5-22	12 mos....	Lab.	.....	18.61	17.22	92.50	Glucose 0.70
Ins. Sta.....	IV-8-22	12 mos....	Lab.	.....	16.79	14.49	86.30	Glucose 1.43
Hat. Fruit....	VI-7-24	11 mos....	Lab.	.....	17.20	14.53	84.87	Glucose 1.85
B H. 10 (12)...	VI-7-24	11 mos....	Lab.	.....	19.20	16.82	87.60	Glucose 0.80
Hat. Fruit....	VI-7-24	R-11 mos.	Lab.	.....	22.50	20.47	90.97	Glucose 0.60
Hat. Fruit....	VI-7-24	R-21 mos.	Lab.	.....	20.30	18.21	89.70	Glucose 0.93
Ins. Sta.....	X 28-24	P-10 mos.	Lab.	.....	15.40	11.57	75.14	.....
Hat. Fruit....	IV-28-24	R-21 mos.	Lab.	.....	17.75	15.48	87.21	.....
Ins. Sta.....	V-10-21	P-17 mos.	Lab.	.....	18.88	17.91	94.91	Glucose 0.89
Aguirre.....	I-2-25	11½ mos.	Cent	65.0	18.10	15.42	85.20	T. sug. p. a. 7.38
Hat. Fruit....	II-3-25	20 mos...	Lab.	8th of 17 v	17.33	15.64	90.25	.....
B.H. 10 (12)...	II-3-25	20 mos...	Lab.	6th of 17 v	17.70	15.98	90.00	.....
Cambalache ..	III-14-24	12 mos....	Lab.	44.12	.....	16.87	91.19	.....
S. C. 124.....	III-14-24	12 mos....	Lab.	42.85	.....	15.94	91.10	.....
Hat. Fruit....	V-14-26	14 mos....	Lab.	.....	20.30	18.69	92.07	Glucose 0.27
B.H. 10 (12)...	V-14-26	14 mos....	Lab.	.....	18.85	16.80	89.12	Glucose 0.35
Hat. Fruit....	V-14-26	17 mos....	Cent	15.00	.....	18.52	91.50	T. sug. p. a. 2.11
B H. 10 (12)...	V-14-26	17 mos....	Cent	21.80	.....	17.90	89.36	T. sug. p. a. 2.92

#### PR-440.

Parents unknown. A very vigorous cane of rather doubtful maturing qualities. Earle considers it of doubtful value for South Coast. Mr. Mateo Fajardo, Jr., of Central Eureka, on the West Coast, reported to the writer on 3rd March, 1924, that it had done very well there. It is a splendid germinator everywhere.

Recumbent, splendid vigor, good stooler, early and prolific arrower. Stalks long, medium diameter, dark purplish red, considerable bloom. Internodes of medium length, tumid, staggered; furrow none. Nodes even; growth ring broad and prominent, narrowing on convex side of curve as cane bends upwards from reclining position, concolorous; root band oblique, wide, 6-10 mms., narrowing towards back, yellowish green to concolorous; rudimentary roots inconspicuous, scattered, 3-4 in rows, concolorous; leaf scar glabrous, broad and prominent in front and appressed behind; glaucous band conspicuously sunken. Buds large, exceeding growth ring by one-third, lanceolate, germination subapical, wide, flat margins covered with short appressed hairs, abruptly shouldered at base; no apical tuft; heavy basal plaes. Leaf sheaths with scanty vestiture of short hairs at back, sides glabrate, purple; inner base lightly tinted, somewhat glaucous; throat lanate with short wooly hairs and long tufts at margins; collar broad and well defined, reaching midrib and of distinct brown color, lanate, with extremely short wooly hairs; ligule rather wide, 3-5 mms.,

nearly even, ligular process none. Leaf blades spreading with declining tips, rather broad, 7.9 cm., distinctly striated, tendency to purple midrib, margins almost even at base, but minutely serrulated towards tips, slightly ciliated at base.

The following analyses have been made (laboratory mill):

Location	Date	Age	Extero.	Brix	Sucr.	Partly	Fiber
Ins. Sta. ....	11-18-21	18 mos ..	67.8	15.49	10.91	70.84	11.59
Christiana .....	11-18-21	18 mos ..	67.5	21.15	19.44	91.78	18.00
Ins. Sta. ....	✓ 15-21	17 mos ..	64.5	15.58	11.73	75.53	
Ins. Sta. ....	1V-20-21	18 mos ..	71.4	17.80	15.18	87.74	11.44
Christiana .....	1V-20-21	18 mos ..	69.9	16.86	18.33	94.92	11.55
Ins. Sta. ....	11-28-21	10 mos ..	70.3	16.86	13.18	78.15	11.88
Christiana .....	11-28-21	10 mos ..	70.5	18.00	16.28	90.44	10.82
Ins. Sta. ....	1V-27-21	11 mos ..	61.0	16.70	12.74	76.28	12.93
Christiana .....	1V-27-21	11 mos ..	69.2	18.30	17.15	98.71	12.32
Apollis .....	✓ 11-18-23	15 mos ..	55.50	17.17	14.17	86.70	
Aguilera .....	11-24-23	14 mos ..	57.65	18.57	16.70	76.70	
Apollis .....	11-21-23	15 mos ..	45.70	13.70	13.70	75.10	
Apollis .....	✓ 11-27-24	16 mos ..	44.70	11.54	11.54	75.10	
Apollis .....	✓ 11-19-24	17 mos ..	44.70	11.50	11.50	75.10	
Ins. Sta. ....	1-5-25	12 mos ..	10.83	19.63	19.63	78.10	
Christiana .....	1V-5-22	12 mos ..	18.51	17.22	17.22	92.50	
Hatillo Fruit .....	1V-28-24	R. 19 mos	55.8	15.70	13.50	85.98	

Practically all of this long series of analyses show diametrically low sugar contents and purities and it is unfortunate that a cane with such a poor record should have become rather widely distributed over the Island merely on account of its very vigorous growth. Certain centrals are even now multiplying this variety rather extensively on the basis of its tonnage yield of cane alone and it appears to the writer that they will be rudely awakened to the low sugar yield of this cane once they have gone to the heavy expense of planting it in large areas. It is certainly not a cane to be recommended.

#### PR 460.

Parents unknown. An exceptionally fine-looking cane on good *regia* lands.

Recumbent, good vigor, fair stooler, arrows early and abundantly. Stalks long, rather slender, pale purple, abundant bloom, red flush. Internodes long, slightly tumid, perpendicular to stalk, with decided tendency to split; furrow wide and shallow. Nodes nearly even; growth ring broad and prominent, parallel, yellowish green becoming concolorous; root band wide, 6-10 mm., parallel, concolorous; rudimentary roots conspicuous, scattered, 3-5 in rows, purplish; leaf scar glabrate, appressed behind, glaucous band constricted and well defined. Buds large, exceeding growth ring by one third, ovate to lanceolate, germination apical, very narrow glabrate margins, no



basal plaes. Leaf sheaths glabrate, purplish, slightly glaucous; inner base lightly tinted; throat lannate, with short appressed hairs and long tufts at margins; collar wide and well defined, reaching midrib, glabrate and glaucous; ligule wide; 4-6 mms., nearly even, ligular process none. Leaf blades spreading with declining tips, broad, 10 by 12 cms., distinctly and uniformly serrated, a few long hairs at base.

The following analyses have been made:

## ANALYSES IN THE INSULAR EXPERIMENTAL STATION PLANT

Date	Brix	Sucrose	Purity	Extract	Glucose	Fiber	Age
VI-1-15	18.80	15.90	83.88				
V-8-16	18.70	16.49	88.16				
IV-8-19	20.00	18.05	90.03	57.3			
V-10-21	17.68	15.51	88.39	60.6	898		17 months
V-10-21	16.96	14.78	87.14	62.5	.949		17 months
III-18-21	19.60	17.51	89.33	66.6	.394	12.02	18 months
Cristalina	21.18	19.44	91.78	67.5	.298	13.00	
IV-20-21	18.95	16.80	88.65	65.7	.380	12.34	13 months
Cristalina	19.30	18.33	94.92	68.9	.197	11.55	
IV-20	19.59	17.44	89.02	55.6	(15th in suc., 14th in P. of 25)		
V-18-20	20.62	18.64	90.39	63.63			
III-18-21	17.20	14.85	85.83	66.10	850	13.56	10 months
Cristalina	18.00	16.28	90.44	70.50	.650	10.62	
IV-27-21	18.00	15.82	87.83	61.20	.936	12.41	11 months
Cristalina	18.30	17.15	93.71	69.20	.290	12.32	
III-3-22	16.89	14.25	84.37	65.94	.732	(Cristalina 18.61 sucrose)	

## ANALYSES IN CENTRAL AGUIRRE PLANT

I-18-23	18.80	15.41	82.00	
II-24-23	18.80	14.53	79.50	

## ANALYSES AT HATILLO FRUIT CO., RIO PIEDRAS

Planted in August 1922; harvested at 19 months

III-21-24	15.68	89.40	Rend. 11.47 42 tons cane per acre
Rayada	16.51	91.00	12.28 22.2 tons cane per acre

Barahona	III-1-25	Plant cut for seed at 8 mos.	Rend 28	tons cane per acre (Anglereau)
B-H. 10(1)	III-1-25	Plant cut for seed at 8 mos.	Rend 26	tons cane per acre (Anglereau)
Guayama	II-6-25	Plant cut for seed at 8 mos.	Rend 24	tons cane per acre (Bermúdez)
Naguabo	V-20-25	Plant cut for seed at 8 mos.	Rend 30	tons cane per acre (Miguel Díaz)
Ins. Sta.	II-9-26	15.14 11.96 79.00	Rend 71.60 tons cane and 6.23 tons sug. p. a.	G. C. at 16 mos.
B-H. 10(12)	II-9-26	17.43 15.00 85.06	Rend 54.81 tons cane and 6.05 tons sug. p. a.	G. C. at 16 mos.
Ins. Sta.	V-27-26	19.30 16.79 87.00	Rend 28.40 tons cane per acre as 13-month ratoons	
H. 109	V-27-26	18.35 16.70 88.10	Rend 25.00 tons cane per acre as 12-month ratoons	

## PR-472.

Parentage unknown. When the writer arrived at the Insular Station in 1923, he found that the stand of this good-looking cane had been lost and managed to obtain some seed from Mr. W. C. Dreier, manager of the Hatillo Fruit Co. Farm near the Station. The only comparison of this cane we have is with Rayada grown at the Hatillo Fruit Farm and ground at Victoria Central. The figures are



as follows, the cane being 19 months old when ground on 21st March, 1924:

Variety	Tns. Cane p. Acre	Sucrose	Purity	Yield Factor
P. R. 472.....	36.3	17.15	88.8	12.49
Rayada.....	22.2	16.51	91.0	12.28

Erect, good vigor, fine stooler. Stalks rather short, but of good girth, yellowish green changing to uniform brownish red, about same shade as D-504, heavy bloom. Internodes rather short, tumid, and appressed at sides, staggered, no furrow. Nodes constricted, oblique; growth ring narrow, 2-4 mms., slightly elevated, concolorous; root band narrow and oblique, concolorous; rudimentary roots small, numerous, 4-5 in rows, concolorous; leaf scar glabrate and appressed behind; glaucous band broad, constricted and rather inconspicuous. Buds medium size, 7-9 mms., plump, reaching growth ring, orbicular, germination subdorsal, purple; margins broad and flat, extending to base, lannation along fibro-vascular bundles, heavy basal places. Leaf sheaths with some dorsal lannation, sides glabrate, heavily tinted, inner base lightly splotched with purple; throat medium width, dark, lannated with very short, appressed hairs and coarse, straggling hairs on margins, tendency to split; collar broad but indistinct, reaching midrib, glaucous; ligule narrow, 2-4 mms., at sides, broadening and becoming peaked at center, no ligular process. Leaf blades plicate with declining tips, medium width to broad, 7-9 cms., dark green with conspicuous white midrib, margins serrated to base, sparse basal ciliation.

Certainly worthy of further trial.

#### PR-487.

Parentage unknown.

Reumbent, good vigor, stalks long, rather slender, pale purple, abundant bloom. Internodes long, very slightly tumid, appressed at sides, perpendicular to stalk, furrow narrow, flat and indistinct. Nodes even; growth ring narrow and prominent, widening at convex side of curve as cane bend upward from declining position, parallel, brownish green changing to concolorous; rudimentary root band narrow, 3-5 mms., oblique, concolorous; rudimentary roots conspicuous, but very few and scattered, 3-4 in rows, purplish; leaf scar glabrate, appressed behind glaucous band constricted and only fairly well defined. Buds orbicular, small, 8-10 mms., never exceeding growth ring, germination apical, margins wide, flat, shouldered at base, glabrous, but with short and distinct apical tuft, no basal places.

Leaf sheaths very heavy on both back and sides, green, inner base heavily tinted with purple, slightly glaucous; throat lannate with scanty marginal vestiture, no marginal tufts; collar rather narrow, well defined and reaching midrib, grayish color, glabrate, glaucous; ligule medium width, 3-5 mms., nearly even; ligular process none. Leaf blades spreading with declining tips, medium width, 7-9 cms., margins ciliated and distinctly serrulated on upper half and almost even towards base, long straggling hairs at base.

The following analyses have been made with samples from Station plats ground in the laboratory mill:

Date	Age	Extr.	Brix	Sucr.	Gluc.	Purity	Fiber
V-27-1918	Plant.		18.23	15.50		85.63	
III-21-21	18 mo.	68.9	18.40	16.48	0.815	89.23	12.44
Cristalina	18 mo.	67.5	21.18	19.44	0.898	91.78	18.00
I 12-20	R 8 mo.	63.1	16.55	13.79		83.27	8th of 17
Mar., 1920	R 11 mo.	59.6	18.94	16.76		82.27	7th of 15
V 13-20	R 13 mo.	57.8	22.35	18.84		84.29	
Cristalina	R 13 mo.			20.46		90.85	
III-28-21	P 10 mo.	67.7	17.20	14.29	1.860	83.08	12.92
Cristalina	P 10 mo.	70.5	18.00	16.28	0.850	90.44	10.62
IV-27-21	P 11 mo.	60.8	18.20	14.14	1.670	77.69	12.54
Cristalina	P 11 mo.	69.2	18.30	17.15	0.200	93.71	12.32
IV-6-22	P 12 mo.	62.9	17.73	15.32	1.287	86.85	
Cristalina	P 12 mo.	62.6	18.61	17.22	0.697	92.50	

These analyses indicate that it is characterized by a comparatively low sugar content. It is now planted out to tonnage experiments in comparison with the other PR canes and BII-10(12) and final opinion on its merits must await the outcome of these tests.

#### PR-491.

##### Parentage unknown.

Erect, at length recumbent, good vigor and good stooler. Stalks long, medium girth, dull purple, with irregular and scar-like discolorations, heavy bloom. Internodes long, barrel-shaped, perpendicular to stalk, decided tendency to split, furrow distinct, broad and flat. Nodes constricted; growth-ring wide and prominent, widening at convex side of curve as cane bends upwards from the recumbent position, oblique, reddish-brown changing to concolorous; root band narrow, 3 to 5 mm., oblique, dark green changing to concolorous; rudimentary roots conspicuous, but very few and scattered, 2 to 3 in rows, purple; leaf scar ciliated, prominent in front and appressed behind; glaucous band constricted and only fairly well defined. Buds triangular-ovate, varying from small to medium, 6 by 8 to 10 by 12 mm., exceeding growth ring by one-third, germination apical, margins narrow to medium, with scanty vestiture of rather long hairs, distinct apical tuft of long hairs, basal plaes with vestiture of short hairs.

Leaf sheaths with scanty dorsal vestiture, at length glabrate, green with purplish tint, somewhat glaucous, inner base slightly tinted with purple; throat lannated with long hairs; collar medium width, well defined, reaching midrib, glaucous; ligule narrow to medium, 3 to 5 mm., fimbriate; ligular process none. Leaf blades sub-erect, with declining tips, broad, 10 to 12 cms., margins distinctly serrulated on upper half, ciliated below straggling hairs at base.

This is a fine-looking cane, which has done fairly well at the Hatillo Fruit Farm, but turned out rather poorly in Mr. Earle's experiments at the Aguirre Central. In 1921 gummosis showed up in the original planting of this variety at the Hatillo Fruit Farm. The first and second ratoons, however, made good growth and showed no external signs of the disease, although some gum showed up at each harvest. As third ratoons in 1923-24, the cane continued to make good growth, but a sample brought in for analysis on 28th March, 1924, although giving a good analysis, showed the gum again. Stools on either side of this infected stool, of other varieties, have not become infected.

The record of this cane follows:

Variety	Location	Age	Extract	Brix	Sucrose	Glucose	Purity
P. R. 491.....	Ins. Sta.	Pl. 12 m.	V-27.18	15.20	13.30	.....	82.00
P. R. 491.....	Ins. Sta.	Pl. 18 m.	70.0	18.10	16.10	0.91	91.16
Cristalina.....	Ins. Sta.	Pl. 18 m.	67.5	21.18	19.44	0.40	91.78

Above pair of analyses made on 21st March, 1921.

P. R. 491.....	Ins. Sta.	Pl. 17 m.	61.1	15.95	12.10	1.90	75.86
P. R. 491.....	Ins. Sta.	Rat. 8 m.	60.7	17.49	15.04	5th of 17	85.99
P. R. 491.....	Ins. Sta.	Rat. 11 m.	62.5	19.02	16.80	5th of 15	88.82

Above plant analysis made 8th April, 1921; ratoons in January and March 1920.

P. R. 491.....	Ins. Sta.	Rat. 13 m.	66.7	20.45	17.97	V-13-20	87.87
Cristalina.....	Ins. Sta.	Rat. 12 m.	.....	.....	20.46	V-13-20	90.35
P. R. 491.....	Ins. Sta.	Pl. 10 m.	70.0	18.00	12.81	2.02	80.09
Cristalina.....	Ins. Sta.	Pl. 10 m.	70.5	18.05	15.28	0.55	89.44

Above pair of analyses on 28th March, 1921; pair below, April 28th, 1921.

P. R. 491.....	Ins. Sta.	Pl. 11 m.	64.9	17.50	14.92	1.55	85.25
Cristalina.....	Ins. Sta.	Pl. 11 m.	59.2	18.35	17.15	0.36	88.71
P. R. 491.....	Aguirre	Pl. 13 m.	.....	17.00	13.66	I-18-23	80.40
P. R. 491.....	Aguirre	Pl. 14 m.	.....	17.25	13.76	II-24-23	78.90
P. R. 491.....	Aguirre	Pl. 15 m.	.....	15.96	12.38	III-24-23	77.80
P. R. 491.....	Hatillo	Rat. 12 m.	73.8	18.65	11.01	IV-28-24	80.66

PR-492. See Plate V, opposite page 239.

Parents unknown.

Erect, at length recumbent, very good vigor and good stooler. Stalks long, medium to stout, green to yellow, no flush or bloom. Internodes long, tumid, very slightly staggered; furrow traces to none. Nodes constricted; growth ring broad and prominent, paral-

lcl, reddish-brown to concolorous; root band wide, 4 to 6 mm., parallel and concolorous; rudimentary roots conspicuous, few and scattered, 3 to 4 in rows, brown; leaf scar, glabrate at back, and distinctly lannated in front, broad and prominent in front and appressed behind; glaucous band slightly constricted and only fairly well defined. Buds ovate, medium size, 9 to 11., sometimes exceeding growth ring, germination apical, margins of medium width and with abundant vestiture of long hairs, heavy apical tuft, light basal places. Leaf sheaths with scanty vestiture at back, sides glabrate, green with purplish tint, inner base slightly tinted, glaucous; throat lannated with short appressed hairs, long straggling hairs at sides; collar medium width, well defined, reaching midrib, gray color, very slightly lannated with minute velvety hairs; ligule narrow, 2 to 4 mm., nearly even; ligular process none. Leaf blades spreading with declining tips, medium to broad, 8 to 11 cms., margins uniformly serrulated, long ciliae at base.

This very excellent variety and its sister cane, PR-433, which it closely resembles, but from which it can easily be distinguished by its long apical tuft, constitute what is probably the best pair of Porto Rican seedlings so far developed. It is a general-purpose cane, doing well on both *vegas* and hills gives, excellent tonnage under most conditions and is a high sucrose cane of quite early maturity, which, however, stands up well in the field. Earle considers it quite resistant to mosaic. Mr. Brebner, in charge of cultivation at Central Aguirre—eastern section—advised the author of a yield of 60 tons per acre of this variety during the first half of January, 1925. Three fields at their Hacienda Carmen gave in tons sugar per acre, 5.49, 6.18 and 6.09. A condensed record of its analyses follows:

Variety	Date	Location	Age	Extract	Brix	Sucr.	Gluc.	Purity
P. R.-492.....	Apr., 1920	Ins. Sta.....	Pl. 12 mo...	65.21	19.18	17.49	.....	91.18
P. R.-492.....	Dec., 1920	Ins. Sta.....	Rat. 13 mo...	72.00	16.79	14.12	2.63	84.09
Av. Cheribón	Dec., 1920	Ins. Sta.....	Rat. 13 mo...	.....	.....	13.69	1.67	85.88
P. R.-492.....	Jan., 1921	Ins. Sta.....	Rat. 14 mo...	63.00	18.25	16.28	1.09	89.10
Cristalina	Jan., 1921	Ins. Sta.....	Rat. 14 mo...	71.40	17.30	15.34	0.64	86.67
P. R.-492.....	Feb., 1921	Ins. Sta.....	Rat. 15 mo...	67.70	19.70	18.11	0.65	91.92
Cristalina	Feb., 1921	Ins. Sta.....	Rat. 15 mo...	71.40	18.90	17.40	0.30	92.06
P. R.-492.....	May, 1921	Ins. Sta.....	Pl. 17 mo...	61.50	19.22	17.33	0.84	90.16
P. R.-492.....	Apr., 1921	Ins. Sta.....	Pl. 13 mo...	71.60	20.55	18.59	0.83	90.41
Cristalina	Apr., 1921	Ins. Sta.....	Pl. 13 mo...	68.90	19.80	18.33	0.20	94.92
P. R.-492.....	Sept. 1922	Aguirre.....	Pl. 9 mo...	Tns. A.-47	12.90	8.84	.....	68.50
P. R.-492.....	May, 1926	Ins. Sta.....	Rat. 13 mo...	Tns. A.-18	20.40	18.05	.....	88.40
H-109.....	May, 1926	Ins. Sta.....	Rat. 12 mo...	Tns. A.-25	18.95	16.70	.....	88.10

This is a most excellent record and PR-492 could well be more widely distributed than it actually is.



## PR-492, Red.

Mr. W. C. Dreier, manager of the Hatillo Fruit Farm on the Trujillo Alto Road, has a cane which he obtained from the Station as PR-492 some five years ago, which in everything but color and even to the characteristic apical tuft, is identical with the yellow cane we have at the Station and widely distributed over the Island. It has also proven to be of similar chemical and cultural characteristics and has given him excellent results on the poor, red, shaly hillsides of that section. It would appear that, in securing a few canes for seed from the Station, it just happened that he obtained a stool representing a red sport of this promising kind. A few analyses from Mr. Dreier's place follow:

Variety	Age	Date	Brix	Sucrose	Glucose	Purity	Yield Factor
P. R. 492 (Red).....	Plant 11 m.	VI-7-'94	16.8	14.46	1.38	86.07	10.04
B. H. 10 (12) .....	Plant 11 m.	VI-7-24	19.2	16.82	0.80	87.60	12.42
P. R. 492 (Red) .....	Rat 11 m.	VI-7-24	19.8	18.08	0.43	91.31	13.62
P. R. 492 (Red) .....	Plant 20 m.	II-3-25	14.8	12.06	1.90	81.76	8.64
P. R. 492 (Red) .....	Plant 14 m.	V-14-26	18.2	15.92	0.33	87.71	.....
B. H. 10 (12) .....	Plant 14 m.	V-14-26	18.85	16.80	0.35	89.12	.....

This kind should be brought back to the Station and tried out in tonnage experiments in comparison with the yellow type here. It gives considerable promise.

## PR-502.

Parentage unknown.

Erect, then recumbent, good vigor, fine stooler. Stalks long, medium girth, yellow at first, becoming olive-green on older joints, no flush, heavy gray bloom. Internodes medium length, slightly tumid and decidedly shouldered at back opposite bud, perpendicular to stalk, furrow broad and shallow. Nodes constricted, oblique; growth-ring wide, 4 to 6 mm., oblique, nearly even, brownish changing to concolorous; root-band narrow, oblique, light creamy to yellow and then to green; rudimentary roots few, small, scattered, inconspicuous, in rows 3 to 4, covered with white wax, yellow-brown to concolorous; leaf scar glabrate, appressed behind; glaucous band narrow, constricted, inconspicuous. Buds medium to large, 8 by 10 mm., triangular-ovate, exceeding growth-ring by one-third to one-half, germination apical; margins medium width, on upper three-fourths only, flat, slightly lannated, shouldering at sides, long, sparse, apical tuft; light basal plaes. Leaf sheaths with heavy vestiture of tawny but deciduous hairs at back, sides glabrate, glaucous, very lightly tinted without, heavily within; throat medium width, dark colored, lannated, with short appressed hairs, long straggling hairs



at margins; collar medium width, reaching midrib, brownish, covered with white wax, ligule narrow at sides, 2 to 4 mm., moderately widening at center, nearly even, no ligular process. Leaf blades spreading, wide, 7 to 8 cms., dark green, minutely serrulated on upper half only, smooth below, sparse basal ciliation.

For no apparent reason, since the only available Station analysis of this good-looking and promising cane was quite good, this kind had been allowed to disappear from the Station plats when the author arrived here in October, 1923, and, after seeing its promising development at the Hatillo Fruit Farm, he obtained a few seeds from Mr. Dreier to multiply for tonnage experiments, which are now under way and in which this cane is showing up well. The first series of analyses given below is the only one available from Station cane and was made on 23rd March, 1921, of 18-month-old plant cane, while the second series is from the Hatillo Fruit Farm and obtained from actual factory results at Central Victoria:

Variety	Extra.	Brix	Sucr.	Gluc.	Purity	Tns Cane per acre	Age
P. R.-502	64.2	17.90	15.80	0.94	88.26		Pl. 18 m.
Cristalina	67.5	21.18	19.44	0.40	91.78		Pl. 18 m.
P. R.-502	27th Mar., 1924		17.03		88.20	43.4	Pl. 19 m
Rayada	27th Mar., 1924		16.51		91.00	22.2	Pl. 19 m
P. R.-502	28th Apr., 1924		15.82		86.92		Rat. 19 m

#### PR-503.

Parents unknown.

Recumbent, good vigor, fair stooler. Stalks long, medium diameter, purple, heavy bloom. Internodes medium length, cylindrical, slightly enlarged at base opposite bud, sometimes distinctly shouldered, slightly staggered, furrow shallow. Nodes even to slightly constricted; growth-ring medium width, even to slightly elevated, parallel, at first yellowish, then dark purple; root-band narrow, oblique, concolorous; rudimentary roots inconspicuous, few and scattered, 3 in rows, white then purplish; leaf scar glabrous, appressed behind; glaucous band constricted, broad and well defined. Buds hemispheric-triangular, medium size, 9 by 11 mm., exceeding growth-ring by one-third, germination sub-apical; margins wide, nearly even, purple, glabrous. Leaf sheaths with scanty dorsal vestiture of deciduous hairs, tinted, inner base very lightly tinted, faintly glaucous; throat slightly lannated; collar broad and well defined, reaching midrib, gray color, glaucous; ligule narrow, 2 to 4 mm., nearly even; ligular process none. Leaf blades suberect, rather nar-

row, nine to eleven cms., margins minutely serrulated on upper half, almost smooth below, very sparsely ciliated at base.

Another variety on which we have very meagre information and which has recently been planted out in tonnage experiments in comparison with other PR canes and with BH-10(12) as a check. The record we have follows, all analyses being from Station plats except the last, which is from very steep, high, red clay hillside at the Hatillo Fruit Farm:

Variety	Date	Age	Extr.	Brix.	Sucr.	Glucose	Purity
P. R. 503	V-27-18...	Pl. 12		16.68	18.80	16th of 20	79.00
P. R. 503	I-12-20	Rat. 8	56.3	15.26	11.88	15th of 17	71.29
P. R. 503	Mar., 20.	Rat. 11	57.5	17.50	14.97	18th of 15	88.84
P. R. 503	May, 20.	Rat. 18	58.9	21.45	18.11		84.47
Cristalina	May, 20.	Rat 18			20.46		90.85
P. R. 503	Mar. 21.	Pl. 18	65.2	16.70	18.95	1.08	83.53
Cristalina	Mar. 21.	Pl. 18	67.5	21.18	19.44	0.40	91.76
P. R. 503	May, 21.	Pl. 17	60.8	15.35	11.54	1.93	75.17
P. R. 503	Apr. 25.	Rat 21	55.8	15.45	12.50		80.90

A very poor record indeed and one that does not offer much indication of its becoming a useful cane here.

#### THE PORTO RICO SEEDLINGS PRODUCED IN 1915

##### PR-507.

A cross of Otaheite and B-347.

Erect, finally recumbent, only fair vigor, long and slender, yellow, slight bloom. Internodes long, cylindrical, slightly staggered, furrow narrow and very shallow, decided tendency to split. Nodes even; growth-ring inconspicuous, medium width, 3 to 5 mm., even parallel, concolorous; root-band narrow, parallel, concolorous; rudimentary roots inconspicuous, few and scattered, 3 to 4 in rows, concolorous; leaf scar glabrate, appressed behind; glaucous band indefinite and rather even. Buds ovate, small, 6 by 8 mm., never exceeding growth-ring, germination sub-apical, narrow, flat margins with scanty vestiture of short hairs. Leaf sheaths sparsely lannated at back, sides glabrate, tinted, somewhat glaucous; throat lannate with short appressed hairs; collar medium width, well defined, reaching midrib, lannated; ligule narrow, 2 to 4 mm., nearly even; ligular process remarkably developed on one side only, 2 to 3 inches. Leaf blades erect with declining tips, rather narrow, 8 to 10 cms., margin serrulated and ciliated, with long, straggling hairs at base.

We have very little available data on this cane, for some unexplainable reason, and must await the results of the tonnage experiments planted out with it and its sister canes last fall before we

can form any opinion as to its value. The scanty record which exists of it at the Station follows:

Variety	Date	Age	Extract	Brix	Sucrose	Glucose	Purity
P. R. 507.....	Feb., 1918	Pl. 15 mths.	.....	22.19	19.96	.....	90.05
P. R. 507.....	Mch., 1920	Pl. 12 mths.	62.5	20.12	18.15	.....	90.20
P. R. 507.....	Apl., 1921	Pl. 18 mths.	67.1	19.66	17.97	0.53	91.15
Cristalina.....	Apl., 1921	Pl. 13 mths.	68.9	19.30	18.33	0.20	94.92

Certainly there is nothing in any of the few analyses to justify the ignoral of this cane at the Station for many years.

#### PR-543.

A cross of Otaheite and B-347.

Recumbent, good vigor, good stooler. Stalks long, medium diameter, greenish-yellow base color, changing through brown to wine color, little bloom. Internodes medium length, cylindrical, slightly enlarged at base opposite bud, distinctly staggered, furrow broad and very shallow. Nodes nearly even, growth-ring medium width, elevated, oblique, yellowish-brown to concolorous; root-band narrow, oblique, yellowish-green; rudimentary roots inconspicuous, few and scattered, 2 to 3 in rows, purplish to concolorous; leaf scar glabrate, broad and prominent in front and appressed behind, glaucous band constricted, broad and well defined. Buds ovate, small to medium, 8 by 10 mm., exceeding growth-ring by one-third, germination apical, flat, narrow margins with little vestiture of short hairs, small apical tuft, light basal plaes. Leaf sheaths with abundant dorsal vestiture of short, brown hairs, purple, inner base extremely lightly tinted with purple, very slightly glaucous; throat lannated, with short appressed hairs; collar medium width, well defined, reaching midrib, lannated with velvety hairs; ligule narrow, 2 to 4 mm., even; ligular process none. Leaf blades spreading with declining tips, broad, 10 to 12 cms., dark green, margins uniformly serrulated and sparsely ciliated at base.

This is another seedling, of the same parentage as PR-545, which has the same reputation here for late maturity and low sugar content, which reputation is not absolutely confirmed by the analyses available, hence, with its sister cane it has been planted out in tonnage experiments at the Station recently in order to get some more definite figures on which to base an opinion. In plats at the Station but it is doing well in the Station field as well as at Central Camalache. On also at the Hatillo Fruit Farm on the Trujillo Alto Road. Our rather scant record on it follows; all but the last two series being from canes off of Station variety plats. The last two

series of analyses are from cane grown at the Hatillo Fruit Farm by Mr. W. C. Dreier:

Variety	Date	Age	Extract.	Brix.	Sucr.	Glucose	Purity	Fiber
P. R.-543 .....	Feb., 1918	Pl. 19 mo. ..	.....	21.50	20.12	.....	93.61	.....
P. R.-543 .....	Apr., 1921	Pl. 13 mo. ..	65.2	19.35	17.10	0.27	91.47	12.72
Cristallina .....	Apr., 1921	Pl. 13 mo. ..	68.9	19.30	18.33	0.20	94.92	11.55
P. R.-543 .....	Jan., 1920	Rat. 10 mo. ..	61.7	4th of 24	18.20	.....	92.19	.....
Cristallina .....	Jan., 1920	Rat. 12 mo. ..	64.6	.....	17.47	.....	91.58	.....
P. R.-543 .....	Mar., 1920	Pl. 12 mo. ..	64.1	18.80	16.80	.....	89.70	.....
P. R.-543 .....	May, 1926	Pl. 14 mo. ..	.....	18.60	16.99	0.33	91.34	.....
B.-H.-10(12) ..	May, 1926	Pl. 14 mo. ..	.....	18.85	16.80	0.35	89.12	.....
T. c. p. a.					T. c. s. a.			
P. R.-543 .....	May, 1926	Pl. 14 mo. ..	19.6	.....	15.20	2.15	83.40	.....
B.-H.-10(12) ..	May, 1926	Pl. 14 mo. ..	21.8	.....	17.90	2.92	89.36	.....

Here again, and even more strongly than in the case of the record of PR-545, the figures found fail absolutely to confirm the dictum that this is a poor sucrose cane. We must, however, await the final results from our tonnage experiments before attempting to give a definite opinion on the probable value of this cane.

#### PR-545.

A cross of Otaheite with B-347.

Erect, then recumbent, very good vigor, fine stooler. Stalks long, good diameter, green to yellow, no flush, some bloom. Internodes long, appressed, slightly staggered, furrow well defined, broad and shallow. Nodes nearly even, slightly constricted at back; growth-ring wide, elevated, especially at back, oblique, yellowish-brown to concolorous; root-band medium width, parallel, concolorous; rudimentary roots crowded, 4 to 6 in rows, purplish-brown to concolorous; leaf scar glabrate, broad and prominent in front and appressed behind; glaucous band constricted, broad and well defined. Buds lanceolate, very large, 12 to 16 mm., exceeding growth-ring by one-third to one-half, germination apical, narrow flat margins, shouldered at base, with scanty vestiture of appressed hairs. Leaf sheaths with dense dorsal vestiture of short, tawny hairs, sides glabrate, slightly tinted within and without, glaucous; throat lannated with long coarse hairs; collar broad and well defined, reaching midrib, glaucous; ligule narrow, 2 to 4 mm., nearly even; ligular process about  $1\frac{1}{2}$  to 2 cms. long, on one side only. Leaf blades spreading with declining tips, wide, 10 to 12 cms., rather light green, margins minutely serrulated on upper half and almost smooth at base, very sparsely ciliated at base.

This is an extremely vigorous cane, which has the reputation of being very low in sugar here at the Station, but on which we need more definite data before ruling it out on this count. Richardson Kuntz, on page 36 of the Thirteenth Annual Report of this Station,



states that this variety has shown itself to be so late maturing and so low in sugar content that no more trials would be conducted with it here. Later we have planted it out in tonnage experiments at the Station along with other PR varieties on which we lack definite data and with BH-10(12) as a check. At both Centrals Cambalache and Plazuela this kind is making a most vigorous growth. Its incomplete record at the Station follows:

Variety	Date	Age	Extract	Brix	Sucrose	Glucose	Purity
P. R -545 .....	Feb., 1918	Pl. 19 mo..	.....	19.00	17.30	.....	91.05
P. R.-545 .....	Mch., 1920	Pl. 12 mo..	65.9	18.92	17.10	.....	90.88
P. R.-545 .....	Apr., 1921	Pl. 13 mo..	71.0	17.60	14.74	0.85	86.20
Cristalina .....	Apr., 1921	Pl. 13 mo..	68.9	19.30	18.33	0.20	94.92
P. R.-545 .....	Mar., 1920	Rat. 15 mo..	.....	17.63	15.78	.....	89.50
P. R.-545 .....	Oct., 1924	Pl. 12 mo..	.....	14.90	10.89	.....	78.09
P. R.-545 .....	Dec., 1924	Pl. 13 mo..	.....	16.40	13.49	.....	82.26

Except for the last two analyses—and the time of the year when these were made must be noted!—this record certainly does not bear out the record as a poor sugar producer which this kind has here.

#### PR-561.

A cross of Otaheite with B-347.

Erect, very good vigor, good stooler. Stalks long, medium diameter, green with slight flush, abundant bloom, discolored striations. Internodes medium length, slightly appressed, enlarged at base opposite bud and sometimes distinctly shouldered, staggered, furrow narrow and shallow. Nodes constricted especially at back; growth-ring broad, elevated, parallel, brownish to concolorous; root-band wide, oblique, concolorous; rudimentary roots crowded, 3 to 5 in rows, brownish to concolorous; leaf scar glabrate, appressed behind; glaucous band constricted, broad and well defined. Buds ovate to sub-orbicular, small, 7 by 9 mm., not exceeding growth-ring, germination sub-apical; narrow margins, heavily lined with long, coarse hairs which at times cover entire back. Leaf sheaths heavily lanated with long, white hairs, sides glabrate, yellowish-green color, inner base heavily tinted with purple, no wax; throat narrow, lanated, long marginal tufts; collar narrow, well defined, reaching midrib, glaucous; ligule narrow, 2 to 4 mm., fimbriate; ligular process 1 to 1½ inches, on one side only, starting below collar. Leaf blades erect with declining tips, rather narrow, 8 to 10 cms., margins distinctly serrulated on upper half and uniformly ciliated below.

A vigorous-growing cane which has been rather widely distributed about the Island without too much being yet known as to its sugar-production qualities. Seen by the writer at Cambalache, Plazuela



and at the Hatillo Fruit Farm on the Trujillo Alto Road, near the Station, at all of which it has made good development. Our record for this variety follows, all analyses being of cane from Station plats:

Variety	Date	Age	Extr.	Brix	Sucr.	Gluc.	Purity
P. R.-561.....	Feb., 1918....	Pl. 19 mo. ....	.....	21.50	20.00	.....	93.00
P. R.-561.....	Jan., 1920....	Rat. 10 mo. ....	62.10	.....	15.43	.....	85.72
P. R.-561.....	Mch., 1920....	Pl. 12 mo. ....	58.57	16.10	12.86	.....	79.82
P. R.-561.....	Mch., 1920....	Rat. 15 mo. ....	.....	18.51	16.20	.....	87.57
P. R.-561.....	Apr., 1921....	Pl. 13 mo. ....	70.40	15.60	12.28	1.93	78.71
Cristalina.....	Apr., 1921....	Pl. 13 mo. ....	68.90	19.30	18.33	0.20	94.92

An uncertain record at the best.

#### PR-579.

A seedling of D-109.

Erect, good vigor, fair stooler. Stalks long and slender, color varying from greenish-yellow, through rose and purple to wine color, heavy bloom. Internodes medium length, cylindrical above and slightly tumid at base, staggered, no furrow. Nodes constricted; growth-ring narrow, even, parallel, concolorous; root-band narrow, especially at back, oblique, concolorous; rudimentary roots numerous, 2 to 3 in rows, purplish to concolorous; leaf scar glabrate, appressed behind; glaucous band constricted, broad and well defined. Buds orbicular-ovate, small to medium, 8 by 10 mm., reaching growth-ring, germination dorsal, margins flat, wide and even, covered with scanty vestiture of short hairs, no apical tuft. Leaf sheaths with abundant dorsal vestiture of deciduous, tawny hairs, sides glabrate, tinted within and without, glaucous; throat broad, lannated; collar broad, well defined, reaching midrib, glaucous; ligule narrow, 2 to 4 mm., nearly even; ligular process none. Leaf blades erect with declining tips, narrow, 6 to 8 cms., margins minutely serrulated on upper half, long straggling hairs at base.

A vigorous-growing variety of rather doubtful value. The data we have on it follows:

Variety	Location	Date	Age	Extract	Brix	Sucr.	Gluc.	Purity
P. R.-579.....	Ins. Sta.....	I-16-20 .....	Rat. 10 m. ..	56.3	.....	18.08	.....	89.02
Cristalina.....	Ins. Sta.....	I-16-20 .....	Rat. 11 m. ..	64.6	.....	17.47	.....	91.58
P. R.-579.....	Ins. Sta.....	Mar. 16-20..	Pl. 12 m. ....	55.6	19.80	16.60	.....	86.54
P. R.-579.....	Ins. Sta.....	Mar. 16-20..	Rat. 14 m. ....	.....	18.94	16.28	.....	85.95
P. R.-579.....	Ins. Sta.....	Mar. 16-21..	Pl. 10 m. ....	61.7	15.50	12.59	1.08	81.22
Cristalina.....	Ins. Sta.....	Mar. 16-21..	Pl. 10 m. ....	70.5	18.00	16.28	0.65	90.44
P. R.-579.....	Ins. Sta.....	Apr. 16-21..	Pl. 11 m. ....	64.1	18.00	15.43	1.11	85.72
Cristalina.....	Ins. Sta.....	Apr. 16-21..	Pl. 11 m. ....	69.2	18.30	17.15	0.30	93.71
P. R.-579.....	Aguirre.....	Jan. 16-23..	Pl. 13 m. ....	.....	21.35	18.13	.....	85.00
P. R.-579.....	Aguirre.....	Feb. 16-23..	Pl. 14 m. ....	.....	20.75	17.01	.....	82.00
P. R.-579.....	Aguirre.....	Mar. 16-23..	Pl. 15 m. ....	.....	21.10	17.55	.....	79.80
P. R.-579.....	Aguirre.....	Dec. 16-24..	Pl. 16 m. ....	.....	17.60	15.13	.....	86.00
P. R.-579.....	Aguirre.....	Dec. 16-24..	Pl. 16 m. ....	.....	18.90	16.44	.....	87.10

On the whole this is a very creditable record.

**PR-649.**

A seedling of B-3750.

Erect, good vigor, fine stooler. Stalks long and thick, green, no flush, heavy bloom, discolored striations on some joints. Internodes medium length, tumid, staggered, furrow slight to none. Nodes constricted; growth-ring wide, elevated, parallel, reddish-brown to concolorous; root-band wide, parallel, concolorous; rudimentary roots few and scattered, 3 to 5 in rows, concolorous to brown; leaf scar glabrate, broad and prominent in front and appressed behind; glaucous band constricted, broad and well defined. Buds triangular-lanceolate, large, 10 by 14 mm., exceeding growth-ring by one-third, germination apical, margins flat, wide, abruptly shouldered at base, nearly glabrate, heavy basal plac. Leaf sheaths with dorsal vestiture of deciduous hairs, inside base heavily tinted with purple, slightly glaucous, green; throat broad and lannated, long and conspicuous tuft of straggling hairs at sides; collar broad, well defined, reaching midrib, lannated with appressed velvety hairs; ligule rather broad, 3 to 5 mm., nearly even; ligular process short, 1 to 2 cms, on one side only. Leaf blades spreading with declining tips, medium width, 8 to 10 cms., dark green, margins distinctly and uniformly serrulated, heavy ciliation at base.

A vigorously growing variety on which we have very little information and which has now been planted out to tonnage experiments in comparison with the other PR canes and with BH-10(12) for a check. The record which we have of it follows; all from Station plats:

Variety	Date	Fiber	Age	Brix.	Sucr.	Gluc.	Purity
P. R.-649 .....	Feb., 1918	15th of 24	Pl. 19 mo...	21.40	17.72	.....	83.80
P. R.-649 .....	I-16-20 .....	10.70	Rat. 10 mo...	.....	15.68	.....	86.66
P. R.-649 .....	IV-20-21...	11.55	Pl. 13mo....	16.60	14.23	1.29	85.72
Cristalina .....	IV-20-21...	.....	Pl. 13mo....	10.80	18.33	0.20	94.92
P. R.-649 .....	Mar., 1920	17th of 17	Pl. 12mo....	15.89	12.33	.....	85.15
P. R.-649 .....	Mar., 1920	1st of 8	Rat. 18 mo...	19.21	17.40	.....	88.28
P. R.-649 .....	Oct., 1924..	.....	Pl. 12 mo...	14.45	10.56	.....	78.07

**PR-662.**

A seedling of B-3750.

Erect, fair vigor, good stooler. Stalks long and of medium girth, greenish-yellow, no flush, heavy bloom. Internodes long, cylindrical and sometimes tumid, staggered; furrow broad and very shallow. Nodes slightly constricted; growth-ring broad, slightly elevated, parallel, greenish-brown to concolorous; rudimentary roots few and scattered, 3 to 4 in rows, inconspicuous, concolorous; leaf scar

glabrate, broad and prominent in front and appressed behind; glaucous band constricted, broad and well defined. Buds sub-orbicular, large 12 by 16 mm., exceeding growth-ring by one-third, margins purple and flat, wide, sometimes waxy, glabrate, germination apical, short and scanty apical tuft, light basal places. Leaf sheaths with abundant dorsal vestiture of long hairs, sides glabrate, green, inner base slightly tinted, no wax; throat broad, dark, lannated; collar broad, well defined, reaching midrib, lannated; ligule narrow, 2 to 4 mm., nearly even; ligular process none. Leaf blades spreading with declining tips, medium to broad, 9 by 11 cms., dark green, margins uniformly and distinctly serrated, scanty ciliation at base.

This is another cane of which we have rather a scant record at the Station, which is given below for what it is worth, and which we planted out in tonnage experiments, along with the other PR seedlings on which we lack data, last fall, the results of which must be awaited before we can venture an opinion as to its probable value:

Variety	Date	Age	Extr.	Brix.	Sucr.	Glucose	Purity
P. R.-662 .....	Feb., 1918 ..	Pl 19 mo ..	.....	21.10	17.14	.....	82.45
P. R.-662 .....	Jan., 1920 ..	Rat. 10 mo ..	64.28	.....	18.40	.....	92.27
Cristallina .....	Jan., 1920 ..	Rat. 12 mo ..	64.55	.....	17.47	.....	91.58
P. R.-662 .....	Mar., 1921 ..	Pl. 18 mo ..	68.00	19.50	17.90	9.38	91.28
Cristallina .....	Mar., 1921 ..	Pl. 18 mo ..	68.90	19.80	18.33	9.29	91.92
P. R.-662 .....	Oct., 1924 ..	Pl 12 mo ..	.....	15.70	11.58	.....	73.76
P. R.-662 .....	Mar., 1920 ..	Pl. 12 mo ..	62.01	10.18	18.67	.....	92.51
P. R.-662 .....	Mar., 1920 ..	Rat. 15 mo ..	.....	16.82	13.50	.....	89.65

There is only one really poor analyses in this admittedly rather deficient lot of analyses and it is, therefore, difficult to understand why this cane has never received any attention at the Station in past years.

#### PR-676.

##### Seedling of B-3696.

Erect, fair vigor, poor stooler. Stalks fair length and of good girth, uniformly purple, with very heavy bloom. Internodes long, cylindrical, almost perpendicular to stalk, furrow well defined, broad and shallow. Nodes constricted; growth-ring broad and elevated, parallel, brownish-red to concolorous; root-band broad, parallel, yellow to concolorous; rudimentary roots few, scattered and inconspicuous, 3 to 4 in rows, concolorous; leaf scar glabrate, broad and prominent in front and appressed behind; glaucous band constricted, broad and well defined. Buds orbicular, large, 12 by 16 mm., scarcely exceeding growth-ring, purple, germination sub-dorsal, margins wide, abruptly shouldered at base, glabrate, short, but conspicuous apical tuft, heavy basal places. Leaf sheaths glabrate, glaucous, inner

base slightly stained with purple; throat wide, with very scanty vestiture of long, coarse hairs at margins; collar wide, well defined and reaching midrib, glaucous; ligule broad, 3 to 5 mm., fimbriate; ligular process broad,  $1\frac{1}{2}$  to 2 cms., on one side only. Leaf blades spreading with declining tips, wide, 10 to 12 cms., dark green, margins uniformly and minutely serrulated, very scanty basal ciliation.

The writer was inclined to omit this cane from this list of mostly somewhat promising canes on account of its poor germination and stooling, but a study of the records at the Station shows such little definite data available on it that we have decided to give it a final chance in tonnage experiments in comparison with the other PR canes rather than to try to definite conclusions on its conduct from observations under limited conditions.

Of all the PR varieties planted out by the author in September, 1924, for a comparative study, this cane showed consistently the poorest germination. Ten weeks after planting, for instance, this variety averaged only  $1\frac{1}{2}$  shoots above ground, against  $9\frac{1}{2}$  per hole for the PR-358, the best germinator in this field. Three weeks later the number of canes in the PR-676 plat was identically the same, while all the other varieties were beginning to stool vigorously.

The meagre record of PR-676 which we have from the Station plats follows:

Date	Age	Extr.	Brix.	Sucr.	Purity	
Feb., 1918 .....	Pl. 19 mo ..	...	21.80	12.80	78.80	
Jan., 1920 .....	Rat. 10 mo. .	60.0	...	15.14	83.82	20th in Suc. out of 24
Feb., 1920 .....	Pl. 12 mo ..	56.6	19.02	16.94	93.81	11th in Suc. out of 17
Feb., 1920 .....	Rat. 15 mo. .	...	19.11	16.48	86.23	3rd in Suc out of 8

This small record is too variable to form any opinion of its sucrose-producing qualities, but on the whole it is not particularly encouraging.

**Rayada.** See Plate XXVII, opposite page 283.

(= Striped Cheribón, = Louisiana Ribbon.) Probably introduced in the early days of the nineteenth century as an admixture with Otaheite. Now found in pure and mixed plantings in all parts of the Island. Since the epidemic of 1872 this has been the most widely planted cane in Porto Rico until the advent of BH-10(12) and SC-12/4.

In all respects except color indistinguishable from Cristalina, which see for detailed description. In this variant the stalks are striped with irregular bands of green or yellow and dark purple. The color



scheme is quite variable. Sports from one form to the other or to the Morada are frequently found in the fields.

Most planters have a decided preference for either Rayada or Cristalina, but they can seldom give a valid reason for their choice. Considerable study over a term of years has so far failed to detect any constant difference between them in cultural characters. Everything said under Cristalina in regard to disease resistance, and adaptability to general planting may be repeated here. Probably the majority of planters will claim that Cristalina is the richer of the two in sucrose. Our plantings have not been so arranged as to properly test this point. The few analyses in our records that are comparable are given below for what they may be worth, but the evidence is by no means conclusive:

Kind			Extr	Brix.	Sucr.	R. S.	Purity	Fiber
Rayada .....	2-4-21	Pl. 16 mo.	64.8	18.55	17.27	0.32	92.93	11.26
Cristalina .....	2-4-21	Pl. 16 mo.	65.2	18.40	17.27	0.65	93.95	11.83
Rayada .....	1-19-21	Pl. 15 mo.	69.7	18.25	16.42	0.34	89.91	12.12
Cristalina .....	1-19-21	Pl. 15 mo.	70.0	17.25	15.96	0.37	92.51	9.60
Rayada .....	11-29-20	Pl. 20 mo.	61.6	16.20	14.50	0.66	89.05	11.78
Cristalina .....	11-29-20	Pl. 20 mo.	61.5	16.47	14.52	1.20	88.15	12.32
Rayada .....	12-15-20	Rat. 10 mo.	68.2	17.63	15.98	0.65	90.12	8.90
Cristalina .....	12-15-20	Rat. 10 mo.	70.0	17.50	15.53	0.28	88.74	9.60
Rayada .....	12-22-20	Rat. 14 mo.	69.5	15.33	13.06	0.98	85.12	9.16
Cristalina .....	12-22-20	Rat. 14 mo.	70.0	17.50	15.53	0.28	88.74	9.60
Rayada .....	4-17-17	Pl. 14 mo.	.....	21.31	20.0	.....	93.90	.....

This last is our highest recorded analysis for Rayada and it is almost exactly identical with the highest recorded for Cristalina, though the two were made from different fields and in different years. So far the chemist seems to confirm the view of the field man that the two kinds are only color variants of the same original stock.

#### REFERENCES

- ROSENFELD, ARTHUR H.—¿Es Superior Nuestra Caña Morada a Nuestra Rayada? *Revista Industrial y Agrícola de Tucumán*, II, 8, pp. 331-4; Ene., 1912.
- STUBBS, W. C.—Results of Field Experiments with Sugar Cane. *La Agr. Expt. Sta., Bull. 6, N. S.*, pp. 102-42; Jan., 1891.

#### Rayada Mexicana.

(=Rayada.) Imported from Mexico by Central Guánica in 1919. Now planted at this Station.

#### Reina Caledonia.

Introduced from Trinidad by Dr. Stahl prior to 1879. This name was first proposed in Trinidad for some unknown introduced cane. Later it was considered as =Cristalina. The cane received under



this name by Dr. Stahl could not have been this kind, for it was poor and feeble in growth. He remarks that "its pompous name is in contrast to its inferior vigor." It seems to have disappeared.

\* *Rosa Morada*.

Imported by Dr. Grivot Grand Court under this name, probably from Guadeloupe, prior to 1879. Said to come from New Caledonia. As nearly as can be determined from the fragmentary early descriptions this is the cane that still exists rather frequently in mixed plantings in the hill districts between Arecibo and Lares, particularly in the neighborhood of Bayaney. Curiously enough, tradition seems to have handed down no name for this cane. When pressed for a name the planters in this district usually call it "Caledonia". It doubtless has a perfectly good name in other countries, but what it is can not even be guessed at present. The one used here has not been seen elsewhere in the literature. Seed cane from Bayaney was once brought in under the name of "Salangor Rojo", but the descriptions by Dr. Stahl make it clear that he applied this name to the self-colored form of Cavengerie, here called Cavengerie Roja, and not to the present variety. The name Sarangola Roja was once applied to this cane by a *colono* near Lares.

Erect, vigorous, stools well, arrows rather freely. Stalk long, medium to medium stout, dull purple, fading to olive brown at maturity, little or no bloom. Internodes rather long, usually compressed laterally and somewhat larger below, furrow faint or none. Nodes constricted; growth ring wide, 4 mm., swollen, usually darker in color, conspicuous; root band oblique, 6 to 8 mm., greenish; rudimentary roots, large, crowded, brown with purplish centers, in 2 to 3 rows; leaf scar glabrous, prominent, appressed behind; glaucous band 8 to 10 mm., well defined. Buds rather large, ovate, 12 to 15 × 10 to 14 mm., exceeding the growth ring by one-third of length, margin narrow, uniform, germination apical, vestiture of appressed basal places and conspicuous apical tuft of long hairs. Leaf sheaths with a moderate vestiture of short hairs; glaucous, usually strongly tinted; throat lannate with short appressed hairs; collar pale brown extending into a broad whitened area along midrib, glaucous not lannate. Leaf blades suberect, the tips declined, 6 to 8 cm. wide, medium dark green, minutely serrulate.

This seems to be strictly a hill-land cane. It did not thrive in our low-land plots. In the red clay hills and on the dry coral red lands it is very much at home, seeming to be equal in growth and vigor to the Cavengerie when planted in the same fields. The few

analyses available indicate that it is much earlier in maturing. It seems to be a fairly sweet cane. It is hard to understand why it has been so completely overlooked while Cavengerie has been so widely planted. Like the latter cane it is resistant to root disease at least on dry lands but unfortunately it is equally susceptible to mosaic, from which it suffers severely. Its reaction to gum disease is not known. This cane should certainly be tested further for high, dry lands where it can be kept clear of mosaic. It has given quite good results to Mr. Dreier on the high, dry lands of the Hatillo Fruit Farm.

Kind	Date	Age	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
Rosa Morada.	12-6-20	Pl. 14 mo.	71.6	16.19	13.14	1.59	81.82	13.82
Av. 5 Cheri....	12-6-20	Pl. 14 mo.	.....	.....	13.69	1.67	85.88	12.29
Rosa Morada.	1-9-21	Pl. 15 mo.	62.5	15.75	13.13	1.32	83.36	12.0
Cristalina.	1-9-21	Pl. 15 mo.	70.0	17.25	15.96	0.87	92.52	9.60
Rosa Morada.	5-5-21	Pl. 18 mo.	62.2	18.70	16.98	0.653	90.80	.....

#### Rosa Rayada.

This name was proposed by Earle for a green and purple striped variant of the above found at Bayaney and brought into the Station collections as X-18. Exactly like the self-colored form except for green stripes on the stalks and leaf sheaths.

#### Saconi.

Dr. Stahl, "Revista de Agricultura", 1887, p. 174. This is probably a misprint for Sacuri. If so, it came from Jamaica. No further reference to this kind has been found.

### THE ST. CROIX SEEDLINGS

With the exception of the famous *SC-12/4, q. v.*, which is in reality a Barbados seedling, this series has been produced at the the Virgin Islands Experiment Station in St. Croix, those previous to 1919 by Dr. Longfield Smith, who was Director of this Station under the Danish Government.

#### REFERENCES

SMITH, LONGFIELD—Report of the Virgin Islands Expt. Sta., 1920, pp. 7-14.

*Idem*—*Ibid.*, 1921, pp. 4-5.

Sta. Cruz-12(4). See Plate XXVIII, opposite page 287.

Seedling of B-6835, produced by Bovell in Barbados. Imported by the Mayagüez Station. Seed from Mayagüez was planted at this





Station in the spring of 1919. It has been considerably distributed by this (Mayagüez) Station, and has spread rapidly over the entire Island, being second only to BII-10(12) in extensiveness of distribution and percentage of Porto Rican sugar crop produced.

Erect, good vigor, fair stooler. Stalks long, medium diameter, green with reddish flush, light bloom. Internodes medium to long, cylindrical or a little compressed, staggered, furrow slight or none. Nodes somewhat constricted, strongly oblique: growth ring broad but rather poorly defined, even or somewhat elevated, yellowish: root band strongly oblique, 5 to 10 mm., concolorous or paler: rudimentary roots crowded, in about 4 rows: leaf scar glabrous, broad and prominent in front, appressed behind: glaucous band constricted, poorly defined. Buds large, lance ovate, about 12 \ 16 mm., exceeding the growth ring by one-third to one-half, margin broad, uniform, germination apical, heavy basal plates, abundant marginal vestiture ending in a conspicuous apical tuft. Leaf sheaths with dense vestiture along the back, the sides glabrate, greenish or slightly tinted, somewhat glaucous, the base slightly stained purple within: throat laminate and with an abundant vestiture of hairs: collar medium width, reaching the midrib, glaucous, the margin slightly laminate: ligule about 4 mm., minutely fimbriate: ligular processes none. Leaf blades erect, usually even to the tips, flat, 7 cm. or more wide, dull green, minutely and sparingly serrulate, the bases even, not ciliate.

As in the case of D-74 and D-95, *q. v.*, this is also a Barbados cane produced by John R. Bovell, the father of so many of the world's promising seedlings, from the identically same seedling parent as our most useful cane in Porto Rico—BII-10(12). It is, hence, in no sense a St. Croix seedling, having been taken with him amongst a number of unnumbered Barbados seedlings by Mr. Bovell when he made a visit in 1912 to the Agricultural Experiment Station in St. Croix, then under the charge of the Danish Government and the directorship of Dr. Longfield Smith. After long trial by Dr. Smith this finally became known at St. Croix' most valuable seedling cane. Hence it would seem that, aside from the famous H-109, most of the seedlings which have gained great reputations for themselves and contributed very materially to the advancement and prosperity of the sugar industries of countries so widely separated over the face of the globe have really originated in that little speck in the broad Atlantic—Barbados—and been produced by that grand old man of sugar-cane varietal work, the Hon. John R. Bovell, for two-score years Director of Agriculture on that emerald isle!



All around the coastal plains of Porto Rico it is difficult to choose between the BH-10(12) and the SC-12/4 varieties, which have both shown uniformly superior results to ALL OTHER CANES with which they have been grown in comparison, including Cristalina, Rayada, D-109, B-208, etc., while in the hills between Humacao and Caguas the preponderance of the evidence given below would indicate that the SC-12/4 is slightly more at home under the conditions of this most excellent cane district than its well-known sister, although very promising results have been obtained with the latter throughout this entire district also.

The BH-10(12) would seem to be more resistant to both mosaic disease and gummosis than the SC-12/4 as well as to drought.

In Central Aguirre, there is a tendency to abandon it in favor of the BH-10(12) on account of its apparent greater susceptibility to gumming. Mr. Matz considers the BH-10(12) practically immune to this dread disease, but the writer has seen a few infected canes of BH-10(12), although there is no doubt that it is more resistant than SC-12/4.

The following tables give an idea of the results obtained with SC-12/4 in distinct sections:

TABLE IX

COMPARISON OF YIELDS OBTAINED FROM SC-12(4) AND RIBBON CANES, ST. CROIX AGRICULTURAL EXPERIMENT STATION

Plant No.	Santa Cruz 12 (4)		Ribbon	
	Tons Cane per Acre	Lbs. Sucrose per Acre	Tons Cane per Acre	Lbs. Sucrose per Acre
1 .....	34.0	8,873	27.8	5,797
2 .....	38.4	8,790	32.0	6,521
3 .....	29.4	6,322	31.2	6,360
4 .....	30.7	5,756	18.3	3,524
5 .....	25.0	5,107	32.0	6,659
Average .....	31.5	6,969	28.1	5,772

TABLE X

COMPARATIVE YIELDS FROM SC-12(4) AND CRISTALINA IN GUANTANAMO, CUBA

Variety	Tons Cane per Acre	Brix.	Purity
S. C. 12 (4) .....	60	17.90	82.45
Cristalina .....	37	17.43	82.13

TABLE XI

## SOME SOUTH COAST RESULTS FOR PORTO RICO

## CROP OF 1923

	Acres		Tons cane per acre	Tons cane per acre	
S. C. 12(4) .....	82.00	Prim. ....	26.38	3.57	.....
B. H. 10(12) .....	283.00	Prim. ....	21.99	3.03	.....
S. C. 12(4) .....	104.00	G. C. ....	45.11	3.57	.....
B. H. 10(12) .....	156.00	G. C. ....	45.46	5.82	.....
S. C. 12(4) .....	6.00	G. C. ....	60.01	7.12	Planted
B. H. 10(12) .....	12.00	G. C. ....	61.73	7.65	after cow-
S. C. 12(4) .....	8.50	G. C. ....	50.48	6.86	peas
B. H. 10(12) .....	81.00	G. C. ....	50.25	6.06	.....
S. C. 12(4) .....	11.00	G. C. ....	56.14	6.82	.....
B. H. 10(12) .....	11.50	G. C. ....	52.17	6.50	.....
S. C. 12(4) .....	10.00	G. C. ....	70.57	8.88	.....
B. H. 10(12) .....	8.50	G. C. ....	80.76	10.46	.....

## CROP OF 1924

S. C. 12(4) .....	58.00	Prim. ....	31.34	4.25	.....
B. H. 10(12) .....	476.00	Prim. ....	29.73	4.08	.....
S. C. 12(4) .....	116.00	G. C. ....	34.97	3.98	.....
B. H. 10(12) .....	399.00	G. C. ....	37.90	4.78	.....
S. C. 12(4) .....	2.75	G. C. ....	80.21	8.62	.....
B. H. 10(12) .....	7.00	G. C. ....	69.54	8.45	.....

## CROP OF 1925

S. C. 12(4) .....	23.00	G. C. ....	70.11	9.02	.....
B. H. 10(12) .....	21.00	G. C. ....	9.49	11.58	.....
S. C. 12(4) .....	11.25	Ratoon ....	88.32	5.03	.....
B. H. 10(12) .....	17.75	Ratoon ....	30.28	4.25	.....

TABLE XII

## SANTA RITA EXPERIMENTS WITH D 117, BH 10(12) AND SC 12(4)

Variety	Plot No.	Tons Cane	Tons Per Acre 96 Sugar	Sucrose	Purity
D 117 .....	1	67.63	4.89	9.82	72.33
B. H. 10(12) .....	2	66.44	6.16	11.95	78.71
S. C. 12(4) .....	3	76.51	6.74	11.52	76.82

TABLE XIII

## BH-10(12) COMPARED WITH RAYADA AT CENTRAL "LOS CAÑOS"

Date	B. H. 10 (12) Gran Cultura		Rayada Ratoons	
	Sucrose	Purity	Sucrose	Purity
111 '29 '31 .....	11.95	83.50	16.30	86.01
31 '31 .....	14.60	81.73	16.38	89.22

TABLE XIV

## CAÑO TIBURONES EXPERIMENT

Variety	Tons Cane per Acre	Sucrose	Purity
Rayada .....	24.24	15.03	90.81
D-117 .....	32.40	13.16	81.67
Cristalina .....	36.00	15.48	89.22
Caledonia .....	39.78	13.04	81.42
S. C. 12 (4) .....	42.85	15.94	90.10

TABLE XI

## ARECIBO RIVER EXPERIMENT

Variety	Tons_per_acre
D-109 .....	43.33
D-117 .....	43.75
B-208 .....	43.33
S.C.-12(4) .....	50.95
B.H.-10(12) .....	50.00

TABLE XVI

COMPARATIVE FACTORY YIELDS OF SC-12(4) AND RAYADA AT  
CENTRAL VICTORIA

Variety	Kind of Cane	Age (Months)	Class of Soil	Month Cut	Factory Yield
S. C. 12 (4) .....	Primav .....	11	High and dry	End Feb.	14.97
Rayada .....	Primav .....	10	High and dry	Early Apr.	13.16
S. C. 12 (4) .....	Primav .....	12	High and dry	End Feb.	13.61
Rayada .....	Primav .....	13	High and dry	End Feb.	13.16
S. C. 12 (4) .....	Gr. Cul. ....	15-16	Low and wet	January	11.24
Rayada .....	Gr. Cul. ....	15-16	Low and wet	January	10.91
S. C. 12 (4) .....	Gr. Cul. ....	15-16	Low and wet	January	10.82
Rayada .....	Gr. Cul. ....	15-16	Low and wet	January	10.66

TABLE XVII

## SC-12(4) AT CENTRAL SANTA JUANA

Date	Net Weight of Cane	Crusher Juice		Factory Yield		Sugar to
		Sucrose	Purity	Total	Colono	Colono
IV-29.....	30,009	18.01	91.8	13.34	8.67	2,602
IV-29.....	22,400	18.18	91.8	13.44	8.74	1,958
IV-30.....	27,940	19.68	93.7	14.72	9.57	2,674
IV-30.....	34,620	19.64	93.0	14.68	9.54	3,293
V-1.....	28,640	20.19	93.4	15.20	9.88	2,830
V-1.....	29,020	19.49	92.8	14.59	9.18	2,751
V-2.....	31,100	18.11	91.4	13.40	8.71	2,706
V-2.....	27,180	19.90	95.2	15.04	9.78	2,666
V-4.....	30,120	19.97	94.1	15.05	9.78	2,941
V-5.....	31,040	20.16	95.0	15.23	9.90	3,073
V-5.....	34,980	20.43	94.5	15.37	9.99	3,495
V-5.....	32,880	20.12	94.4	15.18	9.87	3,196

For details regarding these figures, see the writer's report on these canes.

## REFERENCES

- ROSENFELD, ARTHUR H.—The BH-10(12) and SC-12/4 Canes. Jour. Dept. Agr. of Porto Rico, IX, 3, pp. 215-47; July, 1925.  
 SMITH, LONGFIELD.—Rept. of the Virgin Island Expt. Sta. 1919.

## St. Croix-12(11).

Probably imported by the Mayagüez Station. Central Mercedita planted 3 acres in the fall of 1920.

Not seen, except by the writer in St. Croix in 1923, where it did not look at all promising.

## REFERENCES

- SMITH, LONGFIELD.—Report of the Virgin Islands Agr. Expt. Sta., 1919, p. 9.  
*Idem.*—*Ibid*, 1920, p. 8.

## SC-22(21).

Seedling of SC-12/4. Sent to the author in November, 1925, by Mr. Maybin S. Baker, Agronomist of the Federal Agricultural Experiment Station in St. Croix Virgin Island. A laboratory test of this cane at the St. Croix Station in that month, the cane being but nine months of age, showed it to have more sucrose and less glucose than the ordinary canes there at the same time. During the extreme drought in St. Croix in 1925 this variety did not suffer as much as the other canes at that Station. In appearance SC-22(21) resembles SC-12/4.

Erect, then recumbent, fair vigor, light stooler, very susceptible to mosaic. Stalks long and of good girth, yellowish-green, flushing

heavily on exposure to sun, heavy bloom. Internodes medium to long, appressed at sides, enlarged at base, slightly staggered; furrow long, broad and shallow, at times wanting, inconspicuous. Nodes constricted, oblique; growth-ring broad, 4 to 6 mm., elevated, yellowish-brown to concolorous; root-band medium width, covered with white wax; rudimentary roots few, small and scattered in rows 3 to 4, inconspicuous; leaf scar glabrate, appressed behind; glaucous band broad, constricted and inconspicuous. Buds medium to large, 7 by 10 mm., orbicular, plump, tendency to early swelling, reaching growth-ring, germination apical, margins none; short, broad apical tuft and light basal placs. Leaf sheaths with heavy vestiture of short, tawny, deciduous hairs at back, sides glabrate, glaucous, slightly tinted without, green at base within; throat broad, dark, lannated with short wooly hairs, some straggling hairs at sides; collar broad, reaching midrib, dark, gray, heavily glaucous, lannated with very short, velvety hairs; ligule narrow, 2 to 4 mm., at sides, becoming wide and peaked at center; no ligular process. Leaf blades erect with declining tips, wide, 8 to 9 cms., bluish-green color, not flat, prominent white midrib, uniformly and minutely serrulated and ciliated to base.

## REFERENCES

- BAKER, MAYBIN S.—Report of the Agronomist. Rept. of the Virg. Is. Agr. Experiment Station, 1924.  
*Idem.*—*Ibid.*, 1925.

**St. Kitts Seedling.**

Imported by Mr. Sewall from Antigua in 1911. Said to be a sport from B-208. Mr. Sewall notes that here it reverts to that kind, although we have not yet observed this to be the case at the Station. It was reintroduced to the Station, after having disappeared from cultivation, by Mr. Julius Matz, direct from St. Kitts, in 1922. At the Station it has grown and given results about like B-208, but at the "Los Caños" substation, while not showing up as one of the best of the score of canes being tried there, it is far ahead of B-208, which is the worst attacked variety with mosaic disease. The St. Kitts Seedling seems very much more resistant to this disease than does B-208, although it takes it readily. It occasionally tassels, but is not a great sinner in this respect.

Erect, at length recumbent, good vigor and good stooler. Stalks long and of good girth, yellow basal color, with heavy bloom, flushing to pinkish-brown on exposure to sun. Internodes medium length, slightly tumid and appressed at sides, slightly staggered; furrow short, broad and shallow. Nodes nearly even and oblique; growth-



ring narrow, 2 to 4 mm., even and inconspicuous, concolorous; root-band narrow, oblique, heavy white waxy deposit, concolorous; rudimentary roots very small, few and scattered, 2 to 3 in rows, purplish; leaf scar glabrate, very broad and prominent in front, forming a distinct lip, covering base of bud, appressed behind; glaucous band oblique, sunken and narrow in front, becoming broader and shallow towards back of bud, inconspicuous. Buds large, 10 by 12 mm., plump, exceeding growth-ring by one-third, orbicular, germination sub-apical, margins broad, flat, lannated, winged above and shouldered near base, no apical tuft, light basal plates, lannation along fibro-vascular bundles of scales. Leaf sheaths with scanty dorsal vestiture, sides glabrate, glaucous, green; throat very broad, brownish and distinctly lannated with short appressed hairs, long straggling marginal hairs; collar broad and reaching midrib, lannated, with velvety hairs; ligule medium width to broad, 4 to 5 mm., slightly elevated at center; ligular process short and stubby, on one side only. Leaf blades drooping, broad, 10 to 12 cms., dark green minutely and uniformly serrulated at margins, some basal ciliation.

Variety	Date	Extract	Brix.	Sucrose	Purity	Location	Fiber	Age
54 Kitts Seedling.	IV-11-24	61.10	20.85	19.61	94.06	Ins. Sta.	12.77	Ratoons
B H-10 (12).....	IV-11-24	70.00	24.25	28.20	96.26	Ins. Sta.	10.74	Ratoons

\* **Salangor.**

(=Salangor Blanca.) Introduced by Dr. Grivot Grand Court, probably from Guadaloupe, prior to 1879. Regarded by Dr. Stahl as a variety of great importance, since he considered it very resistant to the prevailing epidemic. This cane was until recently grown in pure cultures at Central Coloso, where fields of several acres were examined by Earle which showed a cultural value and general vigor fully equal to Rayada. It has been found nowhere else on the Island.

Erect but often soon declined, vigorous, seldom or never arrows. Stalks long, medium stout, pallid or yellowish, no flush, very heavy bloom, often marked with faint brownish lines that are obscured by the bloom. Internodes medium length, straight, barrel shaped, furrow faint or none. Nodes constricted; growth ring inconspicuous, poorly marked, concolorous; root band narrow, less than 10 mm., at first whitish then greenish; rudimentary root numerous, crowded, small, purplish, in about 4 irregular rows: leaf scar glabrous, somewhat oblique, appressed behind; glaucous band obscured by the heavy bloom. Buds ovate-acuminate, rather large, about 10 x 15

mm., exceeding the growth ring by one-third or more of the length, often purplish, germination subapical, margin uniform, rather broad, glabrous except for a heavy tuft of long, curled hairs on either side above the base. Leaf sheath with an abundant vestiture of short, suberect, rather weak, pallid hairs, strongly glaucous, pallid greenish, purplish at base within; throat dark brown, densely lannate and with a fringe of long hairs behind the ligule and at the sides; collar conspicuous, reaching the midrib, dark brown, reddish brown when young, glaucous but not lannate; ligule medium; ligular processes none or short and inconspicuous. Leaf blades spreading, light green, flat, 5 to 6 cm., wide, minutely but distinctly serrulate, the base ciliate.

This cane was so highly endorsed on its introduction and presents such a good appearance wherever grown that it seems very strange that it has been so little planted. Apparently it is better adapted to *vega* lands than to the hills, thus being complementary to the last, which was clearly a hill-land cane. It is reported as a sweet, good milling cane but no analyses are available. It has proved to be quite susceptible to mosaic but its reactions to root disease and gum disease have not been determined. It is clearly worthy of a much more extended trial than has ever been given it in this Island. It is one of the old, well-known varieties with a long history in the literature. It is usually considered as = Penang but it is absolutely distinct from the kind so named here.

#### **Salangor Rayada.**

This name is used by Stahl, and according to López Tuero seems to = Rayada, though of this it is impossible to be fully certain. A variant of the above variety was, however, observed by Earle in the fields at Central Coloso which may properly be called Salangor Rayada. It has faint white and green stripings on the stalks.

#### **Salangor Rojo.**

As used by Stahl and López Tuero, this name clearly stands for what is here called Cavengerie Rojo, which see. The cane brought in from Bayaney by Earle under this name has, as already stated, proved to be what is here called Rosa Morada.

#### **Sarangola.**

A local name occasionally heard in Porto Rico. Sometimes it is applied to Cristalina and once Earle found it applied to Rosa Morada. It does not occur in the literature.

#### **\* Seeley Seedling.**

Introduced by Mr. Sewall from Antigua in 1909. At various

times it has been considerably planted at both Central Fajardo and Guánica. Occasionally found in mixed plantings in other parts of the Island. As grown here it is scarcely distinguishable from B-3412. In the former paper on cane varieties by Mr. Earle it was considered as identical, but perhaps the point is not fully proven.

Erect or at length decumbent, vigorous, free stooling, arrowing only in certain localities. Stalks long, slender, usually  $2\frac{1}{2}$  to 3 cm., though sometimes thicker, green with strong reddish flush when fully exposed, bloom light but usually evident. Internodes medium to long, often slightly staggered, compressed laterally, furrow well marked. Nodes slightly constricted, oblique; growth ring inconspicuous, usually slightly sunken, 2 to 3 mm. wide, concolorous; root band oblique, 6 to 10 mm., concolorous, rudimentary roots slightly sunken, inconspicuous with very small, purplish center, in 3 to 4 rows; leaf scar glabrous, appressed behind; glaucous band conspicuous, 8 to 10 mm., scarcely constricted. Buds rather large, ovate, rather obtuse, about  $13 \times 13$  mm., exceeding the growth ring by one-third of length. Margin broader below but not shouldered, about 1 to  $1\frac{1}{2}$  mm., germination apical, the base with places of heavy crisped hairs, margin and apex bearded. Leaf sheaths with heavy vestiture of short, stiff assurgent hairs, green, not much glaucous; throat lannate and with long hairs behind the ligule; collar broad, rather conspicuous, glaucous but not lannate, ligule, 3 to 4 mm. at center tapering to 1 mm. at ends, the edge fimbriate; ligular process none. Leaf blades spreading, more or less in two ranks, crowded, narrow, usually averaging but little more than 5 cm., bright green, minutely but sharply serrulate, the base nearly even.

As here described this differs from B-3412 in the more strongly lannate throat and from B-3405 in the glaucous collar. The leaves, too, seem to average a little narrower, but it is by no means certain that these differences are constant. The material we have under these three names is scarcely distinguishable either by cultural or taxonomic characters. We have no real proof that these names are authentic, or if by chance only one kind has really reached us under these three names which one of the three really represents.

Whatever these facts may be it is a vigorous, strong ratooning cane which gives heavy tonnage under a variety of soil conditions. It is late in maturing and should only be planted as *gran cultura*, since when immature it is very low in sugar. For the same reason it is best planted on uplands, for on low, wet soils it seldom really matures. At 15 to 16 months, if fully ripened by 6 to 8 weeks of dry weather, it develops a high degree of sucrose and purity.

Comparatively few analyses are available under this name, but the following will illustrate what may be expected when green and when fairly well matured:

Kind	Date	Age	Extr.	Brix.	Sucr.	R. S.	Purity	Fiber
Sealey S. ....	1-12-12	.....	.....	14.8	10.6	8.2	71.6	.....
Sealey S. ....	12-15-20	Rat. 14 mo. ....	69.6	14.69	11.59	2.49	79.76	18.5
Cristalina. ....	12-15-20	Rat. 14 mo. ....	70.0	17.53	15.53	0.28	88.74	9.60
Sealey S. (1). ....	1-24-21	Rat. 15 mo. ....	70.1	14.47	10.87	1.88	75.47	18.11
Cristalina. ....	1-24-21	Rat. 15 mo. ....	70.3	17.85	16.14	0.83	90.42	10.69
Sealey S. (2). ....	2-25-21	.....	.....	19.70	17.85	.....	90.60	.....

(1) Still green.

(2) Getting ripe.

This is a kind that may give very profitable results if planted in pure cultures and harvested with good judgement, but it is clearly unwise to let it become mixed with other kinds where it is likely to be cut while containing only 10 or 11 per cent of sugar in the juice.

Its strong resistance to root disease and good ratooning powers are its chief advantages. It is quite susceptible to mosaic and suffers badly when attacked. Its reaction to gum disease has not been determined. Its further planting is recommended to those who will study its peculiarities. Those who will not had better follow Earle's advice and leave it alone.

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WATTS, FRANCIS—Sugar-Cane Experiments in the Leeward Islands in the Season 1919-20.—Pt. I, Expts. with Varieties. Issued by the Commissioner of Agriculture for the West Indies, 1921.

#### \* Tamarin.

Introduced by Dr. Grivot Grand-Court, probably from Guadeloupe, prior to 1879. The name originated in Mauritius. The cane is said to come from New Caledonia. Found sparingly in mixed plantings in the hills between Arecibo and Lares. Not seen elsewhere.

Erect at length decumbent, of medium vigor, arrowing not observed. Stalks of medium length and diameter dark purple, with moderate bloom. Internodes medium length, barrel shaped, furrow none. Nodes strongly constricted; growth ring wide, 3 to 4 mm., somewhat sunken, yellow then concolorous or darker; root band about



8 mm., concolorous, rudimentary roots with dark purple centers, in 3 to 4 rows; leaf scar glabrous, appressed behind; glaucous band constricted, about 8 mm., conspicuous. Buds ovate, 8 to 9  $\times$  10 mm., somewhat exceeding the growth ring, margin medium width, uniform, germination subapical, basal plaes of crisped hairs extending onto the margins, apex glabrous. Leaf sheaths with medium vestiture, glaucous, tinted, the base within stained purple; throat nearly glabrous with a few long marginal hairs; collar broad, pallid, not reaching the midrib, glaucous; ligule broad, 5 mm., fimbriate, ligular processes on only one side, broad and short, the edge fimbriate. Leaf blades spreading, bright green, 5½ to 6½ cm. wide, very minutely serrulate, the base ciliate.

Only seen on hill lands, where it is of only moderate vigor. It is susceptible to mosaic; behavior to other diseases not observed. It is a soft cane and reported to be very sweet, being much sought by the laborers for chewing. No analyses are available. Its agricultural value is problematical.

#### Tanna.

Canes called Black Tanna were cultivated on the Station grounds in 1913. The seed was brought in from nearby fields. From the descriptions on file they seem to have been the self-colored forms of Cavengerie, here called respectively Cavengerie Roja and Cavengerie Negra.

In the spring of 1920 seeds of striped Tanna were sent to this Station by Director May of the Federal Station, who imported them from Guadaloupe. Unfortunately, they failed to grow. The variety is, however, growing in the plots of the Station at Mayagüez.

#### Toledo.

Parentage totally unknown. Found by Brandes growing on Toledo Plantation in the Philippine Islands and given this name by him. It is evidently an adventitious cross of Negros Purple or some other noble cane with a Chinese or North Indian cane, as it is very similar in general appearance to the P.O.J. series from Java. Brandes reported it as immune to Mosaic when first imported, but on 3rd April, 1926, Mr. Luis Serrano rogued two infected stools from a planting of this variety in a hillside tonnage experiment at the Station, so, as with so many other varieties hitherto considered immune, Toledo can now be called only highly resistant.

Erect, good vigor and good stooler. Stalks long and excessively thin, purple, heavy grayish bloom. Internodes medium to long, tapering perpendicular to stalk; furrow from triangular flattening



to none. Nodes elevated and oblique; growth-ring narrow, 2 to 4 mm., slightly elevated, green to concolorous; root-band narrow, oblique, green to concolorous; rudimentary roots few, scattered, in rows 2 to 3, purple, conspicuous; leaf scar glabrate, appressed behind; glaucous band broad, tapering, inconspicuous. Buds medium size, 7 by 9 mm., ovate, reaching growth-ring, germination apical, margins narrow and intended at apex, flat, glabrous, no apical tuft or basal placs. Leaf sheaths closely adhering, with abundant vestiture of tawny, deciduous hairs at back, sides glabrate, glaucous, slightly tinted at base within and out; throat narrow, dark very scanty vestiture of short, wooly hairs, few coarse straggling hairs at sides; collar narrow, glaucous, reaching midrib; ligule narrow, 2 to 4 mm., becoming wide and peaked at center, ciliated on upper margins; ligular process on one side only, spur-shaped. Leaf blades spreading, narrow, about 4 cms., dark green with pronounced white midrib, uniformly serrulated and ciliated to base.

No field or factory data are as yet available, as this variety was obtained from Dr. Brandes only in January, 1925, by Commissioner of Agriculture Carlos E. Chardón, although, due to its rapid development, we were able to multiply from these two original seed-pieces enough cane to plant out a tonnage experiment with this variety in comparison with ten canes of the Chinese type in November of the same year.

#### REFERENCES

- BRANDES, E. W.—Mosaic's Role in Limiting Louisiana's Yield. *Facts abt. Sugar*, 28th June, 1924.  
 HIND, R. RENTON.—Toledo Cane, a Mosaic-Immune Variety. *Phil. Sug Cent. and Plants Noiks*, XV, 3 pp. 105-1013.

#### T-77.

Imported from Audubon Park, Louisiana, in 1904 by the Mayagüez Station. This cane was considerably planted at Guánica, 1910 to 1912, and was tested by Sewall at Naguabo, who got his seed from the Mayagüez Station. It was in cultivation at this Station from 1911 to 1913. In the Aguirre variety tests in 1911 it gave, tons cane, 61.42; brix, 19.19; sucrose, 15.85; purity, 82.6; tons sugar, 6.95. In 1912 at this Station it gave, brix, 17.2; sucrose, 14.6; glucose, 1.4; purity, 84.9; and in 1913 ratoon 12 months, brix, 17.01; sucrose, 15.07; purity, 88.6. Mr. Sewall reports February 25, 1912, brix, 17.10; sucrose, 15.70; purity, 91.8. It is described as a rather slender red cane.

Not seen.

## THE TUCUMÁN SEEDLINGS

Bred by Mr. G. L. Fawcett, Botanist and Plant Pathologist of the Agricultural Experiment Station in Tucumán, Argentina, who, with Dr. Cross, the Director, have been kind enough to send us quite a good series of these canes. All that we have are very thin, heavily stooling types, showing Chinese or P.O.J. ancestry and most of them seem almost immune to mosaic disease and root troubles. Five of them have been planted out in tonnage experiments at the Station, where they are making good development, and four of them in substations under hill conditions at Bayaney and on good *vega* land at "Los Caños". In both substations they are making enormous growth. We know nothing of their sugar content as yet and Mr. Fawcett's reports so far are not very encouraging.

## REFERENCES

- CROSS, W. E.—Las Cañas "Tucumanas". *Revista Industrial y Agrícola de Tuc.*, VIII, pp. 251-55; 1918.  
*Idem.*—Las Cañas Tucumanas en la Cosecha de 1919. *Ibid*, IX, pp. 161-7; 1919.

Tuc-439.

Imported in July, 1924.

Erect, fine vigor, stools prolifically. Stalks long and slender, rosy purple in color, heavy and uniform bloom. Internodes long, cylindrical but slightly enlarged at base, not staggered, furrow inconspicuous, concolorous, narrow and deep. Nodes slightly constricted, oblique, growth ring broad, prominent and oblique, green becoming concolorous; root band narrow, oblique, yellowish green to concolorous; rudimentary roots few and scattered, 2-3 in row, purplish to concolorous; leaf scar glabrate, broad and prominent in front and appressed behind; glaucous band inconspicuous, constricted in front and even behind. Buds small to medium,  $8 \times 10$  mm., reaching growth ring, orbicular, germination subdorsal, margins broad and flat on upper part only, shouldering abruptly and giving bud a distinct urn-shaped appearance, slightly lannate, no basal placs. Leaf sheaths almost glabrate, with few scattered dorsal basal hairs, no wax, purple when young, older sheaths tinted, inner base heavily tinted with purple; throat medium width and sparsely lannate, with long straggling hairs at margins; collar narrow, inconspicuous, reaching midrib, glaucous; ligule wide, 4-6 mm., nearly even; ligular process broad and long, on one side only, deciduous. Leaf blades spreading with declining tips, medium width, 6-7 cms., dark green, margins uniformly serrated, some basal ciliation.

This variety, while very thin and having the defect that the leaf-sheaths adhere very tenaciously to the stalk as in the case of Uba, is making remarkable stools in the tonnage experiments at the Station and in the substation at Bayaney.

**Tuc-444.**

Received from Dr. W. E. Cross, Director of the Experiment Station in Tucumán, Argentina, in October, 1925, and planted out for extension. No data are as yet available as to its behavior anywhere.

Erect and then recumbent, good vigor and stooling qualities. Stalks long and thin, green and overlaid with roseate flush, heavy bloom. Internodes long, cylindrical, slightly staggered, no furrow. Nodes prominent, parallel; growth-ring narrow, 2 to 4 mm., even, inconspicuous, brownish to concolorous; root-band narrow, bulging, yellowish-green to concolorous, covered with reddish wax; rudimentary roots large, few and scattered, in rows 2 to 3, purplish to brown, tendency to premature sprouting; leaf scar glabrate and appressed behind; glaucous band broad, tapering, inconspicuous. Buds small to medium, 6 by 8 mm., oval, reaching growth-ring, germination subdorsal, margins very narrow, on upper half only, sparsely lannated, no apical tuft or basal plaes. Leaf sheaths with sparse vestiture of tawny hairs at back, sides glabrate, glaucous, green outside and slightly tinted on inner base; throat broad, dark colored, covered with short appressed hairs, some straggling coarse hairs at margins, tendency to split at sides; collar broad, glaucous, dark, reaching midrib; ligule narrow at sides, 2 to 4 mm., abruptly widening at center, nearly even on upper border; ligular process none. Leaf blades spreading, narrow, 4 to 5 cms., dark green, serrulated and ciliated to base.

**Tuc-454.**

Received from Dr. W. E. Cross, Director of the Experiment Station in Tucumán, Argentina, in October, 1925, and planted out for extension. No data are as yet available as to its behavior anywhere.

Erect, good vigor and stooling qualities. Stalks long and excessively thin, general appearance and color of Uba. Internodes long, tapering, perpendicular to stalk, no furrow. Nodes prominent and parallel; growth-ring narrow, 2 to 4 mm., slightly elevated, brownish to concolorous; root-band wide, bulging, yellowish-green to concolorous; rudimentary roots small, few and scattered, inconspicuous, in rows 2 to 3, purple to concolorous; leaf scar glabrate, appressed behind, lipped in front; glaucous band broad, tapering except at front where it is constricted, indistinct. Buds small, 5 by 7 mm., oval, reaching growth-ring, germination sub-apical, margins broad

and flat, on upper half only, glabrous, no apical tuft or basal placs. Leaf sheaths closely adhering, glabrate, glaucous, green; throat narrow, dark gray, lannated with short wooly hairs, coarse straggling hairs at margins; collar narrow, dark, reaching midrib, glaucous; ligule narrow at sides, becoming abruptly wider and peaked at center; ligular process long and thin on one side only, 2 to 3 cms. Leaf blades spreading, narrow, 4 to 5 cms., dark green, serrulated except at base, scant basal ciliation.

**Tuc-472.**

Received from Mr. George L. Fawcett, Botanist of the Tucumán Experiment Station, in July, 1925, and planted out for extension. Is making a most vigorous growth and will be planted out in tonnage experiment this fall. Nothing yet known as to its sucrose yield.

Erect, good vigor and good stooler. Stalks long and excessively thin, dark purple, heavy bloom. Internodes exceptionally long, as with kassoer cylindrical, perpendicular to stalk, characteristic long, flat, wide furrow, extending almost entire length of internode. Nodes somewhat elevated, parallel; growth-ring narrow, 2 to 4 mm., nearly even, brownish to concolorous; root-band narrow, slightly bulging, covered with reddish wax; rudimentary roots large, few and scattered, in rows 3 to 4 purplish, elevated; leaf scar glabrate and appressed behind; glaucous band broad, tapering and inconspicuous. Buds small, 5 by 7 mm., ovate, reaching growth-ring, germination apical, margins narrow, uniform, on upper half only, nearly glabrate, no apical tuft, light basal placs. Leaf sheaths closely adhering, glabrate, tinted within and without, no wax; throat narrow, brownish, covered with short velvety hairs, coarse, long and straggling hairs at margins; collar narrow, reaching midrib, glaucous; ligule narrow at sides, becoming very wide and peaked at center, ciliated on upper border; ligular process on one side only, lanceolate, long. Leaf blades spreading, narrow, about 4 cms., dark green, minutely and uniformly serrulated and ciliated.

**Tuc-491.**

Imported in July, 1924.

Erect, later recumbent, fine vigor, stools prolifically. Stalks long and slender, basal yellow color, heavily overlaid with rusty purple striations, heavy bloom. Internodes long, cylindrical, not staggered, some tendency to splitting, no furrow. Nodes, enlarged, oblique growth ring narrow and inconspicuous, even yellow to concolorous; root band wide, oblique, prominent, yellow to concolorous; rudimentary roots few and scattered, 3-4 in a row, purple; leaf scar glab-



rate, appressed behind; glaucous band inconspicuous and tapering. Buds small and plump,  $6 \times 8$  mm., reaching growth ring, orbicular, germination subdorsal, margins none, scanty upper vestiture of short hairs, no basal plac. Leaf sheaths almost glabrate, with very few scattered dorsal basal hairs, green, slightly glaucous, inner base slightly tinted with purple; throat narrow and covered with velvety hairs, coarse hairs at margins; collar narrow, reaching midrib, glaucous; ligule medium width, abruptly enlarged at center; ligular process none. Leaf blades spreading with declining tips, narrow, 4-5 cms., dark green, upper margins extremely minutely serrulated, no basal ciliation.

In the Station tonnage experiments and in the *vega* substation at "Los Caños", this variety is looking particularly well and is the stoutest and best looking in general of all the Tucumán seedlings we have. It has the general appearance of P.O.J. seedling.

#### **Tuc-507.**

Obtained from Dr. Cross in July, 1924. Is making vigorous growth and magnificent stools in Station tonnage experiments and at hill-land substation at Bayaney, under the charge of Mr. A. M. Quintero. No data as yet available as to sugar content, either in the Argentine or here. One objectionable feature of this variety is the abundance of long, spiny hairs at back of leaf sheath—particularly in a variety of such closely-adherent leaf sheaths as is this.

Recumbent, fine vigor, stools prolifically. Stalks long and exceedingly thin, wine color, heavy bloom. Internodes long, cylindrical and staggered, no furrow. Nodes almost even, oblique; growth ring narrow and inconspicuous, even, yellowish green, becoming concolorous; root band narrow, oblique, yellow becoming concolorous; rudimentary roots few and scattered, 2-3 in rows, purplish to concolorous; leaf scar lannate, appressed behind; glaucous band inconspicuous, tapering. Bud small,  $6 \times 8$  mm., reaching growth ring, orbicular, germination dorsal, margins flat and abruptly shouldered above, giving distinct urn-shaped appearance to bud, very characteristic wide apical tufts of long straight hairs, no basal plac. Leaf sheaths abundantly and uniformly covered with long tawny hairs, green inner base slightly tinted with purple; throat wide and lannate, with long straggling hairs at margins; collar wide, reaching midrib, glaucous; ligule medium width, 3-5 mm., nearly even; ligular process none. Leaf blades spreading with declining tips, narrow, 4-5 cms., dark green, margins serrated almost to base, extremely sparse basal ciliation.



**Tuc-510.**

Similar to Tuc.-507 in general appearance and type of growth. Is developing splendidly in Station tonnage experiments and at the "Los Caños" substation, in charge of Mr. Antonio Fraticelli. This cane lacks the objectionable spines so noticeable on back of leaf sheath of Tuc.-507. No chemical data are available on this cane, either in the Argentine or in Porto Rico, as the first tonnage experiments were planted out only in the fall of 1925.

Erect, fine vigor, stools prolifically. Stalks long and excessively slender, yellow base overlaid with grayish purple bloom. Internodes long, cylindrical, slightly staggered, furrow broad, flat and inconspicuous to none. Nodes almost even; growth ring narrow, slightly elevated, yellow to concolorous; root band narrow and prominent, oblique, yellow; rudimentary roots few and scattered, 2-3 in rows, inconspicuous, concolorous; leaf scar glabrate, appressed behind; glaucous band inconspicuous, constricted under bud and even at back. Buds small and plump, 5  $\times$  7 mm., not exceeding growth ring, orbicular, germination dorsal, margin broad and flat above, abruptly shouldered laterally, glabrate. Leaf sheaths closely adherent, glabrate, no wax, inner base very lightly tinted with purple; throat narrow and inconspicuous almost glabrate; collar medium width, reaching midrib, glaucous; ligule broad and fringed; ligular process none. Leaf blades spreading declining tips, narrow, 4-5 cms., dark green, very minutely serrulated, very sparse basal ciliation.

**Tuc-511.**

Received from Director Cross, of the Tucumán Experiment Station, in October, 1925, and planted out for extension. Making rapid development and can be planted out to tonnage experiments this fall. No data as yet available anywhere as to value as sucrose producer.

Erect, fine vigor, excellent stoler. Stalks long and thin, rose colored to purple, heavy bloom. Internodes long, cylindrical, perpendicular to stalk, furrow none. Nodes prominent and oblique; growth-ring, narrow, 2 to 4 mm., even, green to concolorous; root-band narrow, light green through pink to concolorous, somewhat elevated, covered with abundant bloom; rudimentary roots few, large and scattered, in rows 3 to 4, purple to brown; leaf scar glabrate, appressed behind; glaucous band broad, tapering, inconspicuous. Buds small to medium, 6 by 8 mm., ovate, at times exceeding growth-ring, germination apical, margins flat, narrow, uniform and on upper two-thirds only, sub-glabrate, no apical tuft, extremely light basal places. Leaf sheaths rather closely adhering, glabrate, tinted within

and without; throat narrow, dark colored, lannated with long silky hairs protruding from margins; collar narrow, glaucous, lannated, with velvety hairs, reaching midrib; ligule narrow at sides, 2 to 4 mm., widening at center, fimbriate; ligular process on one side only, long and narrow, about 2 cms. Leaf blades spreading narrow, 4 to 5 cms., dark green, minutely serrulated and ciliated to base.

**Tuc-531.**

Received from Director Cross, of the Tucumán Experiment Station, in October, 1925, and planted out for extension. Making rapid development and can be planted out to tonnage experiments this fall. No data as yet available anywhere as to value as sucrose producer.

Erect then recumbent, good vigor, fine stooler. Stalks long and excessively slender, purple with heavy wax deposit. Internodes long, cylindrical, perpendicular to stalk, no furrow. Nodes elevated and parallel; growth-ring wide, 4 to 6 mm., even, yellowish-green to concolorous; root-band wide, elevated, yellowish-green to concolorous; rudimentary roots few, large and scattered, in rows 3 to 5, dark purple; leaf scar glabrate, appressed behind; glaucous band tapering, broad and inconspicuous. Buds small, 5 by 7 mm., oval, plump, reaching growth-ring, germination sub-apical, margins narrow and on upper half only, sub-glabrate, with a very few short hairs, no apical tuft or basal plaes. Leaf sheaths closely adhering, heavy vestiture of long, tawny hairs at back, sides glabrate, slightly tinted within and without; throat narrow, dark gray, covered with short, coarse hairs, tendency to split at sides; collar narrow, reaching midrib, glaucous, covered with short wooly hairs; ligule narrow at sides, becoming wide and peaked at center, undulating border; no ligular process. Leaf blades spreading, narrow, about 6 cms., dark green, noticeable white midrib, margins almost smooth, no basal ciliation.

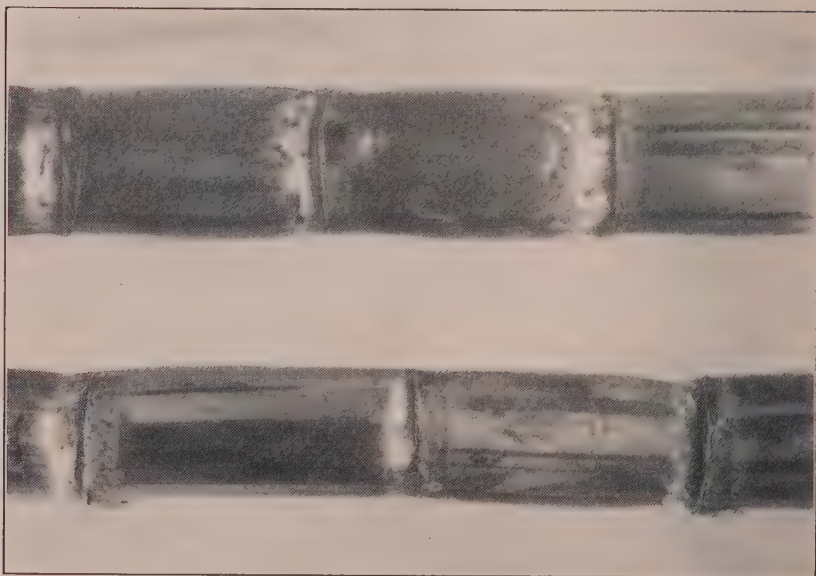
**Tuc-544.**

One of the original lot of five Tucumán seedlings sent by Dr. W. E. Cross from the Tucumán Experiment Station in July, 1924, and the one which has shown up poorest of the lot. It is an excessively slender red cane of very little promise either as plant or stubble, with a very pronounced tendency to premature sprouting. It has, however, been planted out in tonnage experiments with its sister canes and Kassoer and after the crop next spring we shall know more definitely of the qualities as a cane and sugar producer of Tuc.-544.

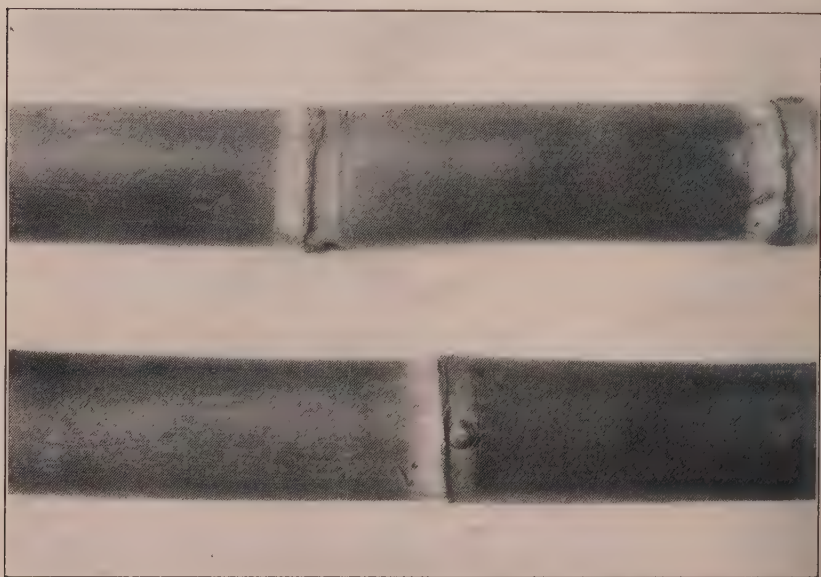
Spreading, good vigor, fine stooler. Stalks long and excessively slender, wine colored with grayish bloom. Internodes long, cylindrical, perpendicular to stalk, no furrow. Nodes prominent, parallel;



RAYADA



YELLOW CALEDONIA



growth-ring broad, 4 to 6 mm., yellowish-green to concolorous, nearly even; root-band medium width, bulging, yellowish-green to concolorous; rudimentary roots large, few and scattered, in rows 2 to 3, purplish, marked tendency to premature sprouting; leaf scar glabrate, appressed behind; glaucous band broad, tapering, indistinct. Buds small and plump, five by seven mm., ovate, reaching growth-ring, germination sub-apical, margins medium width, on upper half only, uniform, very lightly lannated, short and light apical tuft, no basal plaes. Leaf sheaths with heavy vestiture of coarse hairs at back, sides glabrate, purplish to red outside, tinted purple at base within; throat broad, dark, lannated with short woolly hairs, long straggling hairs at margins; collar broad, heavily covered with white wax deposit, reaching midrib; ligule narrow at sides, 2 to 4 mm., widening abruptly and becoming peaked at center; rudimentary ligular process on one side only. Leaf blades spreading, narrow, about 4 cms., dark green, serrated except at base, where there is scanty ciliation.

**Verde Zic-Zac.**

Stahl, p. 137:

"I will so call a certain green cane whose joints form a zig zag until I know its true name. It is superior in sweetness to many other varieties."

This is the sum total of our knowledge of this kind which is very probably the same mentioned by Deerr in the article previously quoted as having been introduced into Jamaica by Captain Bligh in 1793, together with his introduction of Otaheite. No cane clearly referable to this variety has been found by us in Porto Rico, though Mr. Deerr informed Mr. Earle verbally of having seen such a cane at some of the loading stations in the western part of the Island at the time of his visit in January, 1920.

**White Transparent.**

See Cristalina.

**\* Yellow Caledonia.** See Plate XXVII, page 305.

First introduced by D. W. May, Director of the Federal Station at Mayagüez, in December, 1904, from Audubon Park, Louisiana, under the name of Rose Bamboo. Later, in 1909, reintroduced from Ewa Plantation, Hawaii, by Mr. E. E. Olding, then administrator of Central San Cristóbal, Naguabo. First extensively grown and disseminated by Mr. Sewall of Naguabo (see letters of May and Sewall). At present rather extensively planted in nearly all parts of the Island, but especially on the northern and western coasts. Was at one time probably third in total acreage, only exceeded by Rayada and Cris-



talina, but is now rapidly disappearing again, and many centrals refuse to accept it.

Strictly erect, very vigorous, strong stooling, very seldom arrowing. Stalks medium stout, green, with heavy reddish flush where exposed, usually marked with brown lines, bloom none or very faint. Internodes medium length, straight, cylindrical, furrow none. Nodes not constricted; growth ring rather broad, 2 to 4 mm., even or a little sunken, usually light green; root band narrow, somewhat oblique, 6 to 10 mm., greenish; rudimentary roots small, dark purple, in 3 to 4 rows; leaf scar glabrous, nearly perpendicular, narrow, appressed behind; glaucous band conspicuous, about 8 mm., usually reaching but not exceeding the growth ring, margin uniform, very narrow, germination long delayed, subapical, nearly glabrous except for heavy apical tuft which reaches 4 mm. Leaf sheaths glabrous, green or sometimes tinted below, glaucous, conspicuously stained with purple within, especially at base; throat wide, dark brown, densely lannate, a circle of sparse rather short hairs behind the ligule, especially toward the margins and extending unto the shoulders; collar broad, dark brown, extending to the midrib, densely lannate, ligule tapering toward the ends, 2 to 4 mm., margin uneven, somewhat fimbriate; ligular processes none. Leaf blades erect with the tips declined, flat, broad, 7 to 8 cm., dark green, very minutely serrulate, the margin even below or sometimes scantily ciliate.

The extensive planting of this cane led to many heated discussions between mill owners and *colonos*, the former wishing to restrict its planting on account of its low average sucrose while the latter insisted on planting it because of its high tonnage. This trouble largely came because the nature of the variety is not well understood. If cut green at 11 to 12 months, and especially if rains are frequent, it will have very little sucrose and be high in reducing sugars, making the yield so small that it does not pay to grind it. It is a late-maturing cane, requiring age and at least 4 to 6 weeks of dry weather in which to ripen. It should never be cut before April when, though never as rich as *Cristalina*, it will give a very satisfactory yield. If handled in this way, on old compacted lands, it will give a much larger output of sugar per acre than either *Rayada* or *Cristalina*. It is pre-eminently a low-land cane thriving only moderately on dry hills. It should not be planted on lands that still give a satisfactory tonnage of the better kinds. It is especially indicated for those old and compacted maritime *vega* lands where *Rayada* and *Cristalina* now fail from root disease. In such localities it will give much greater ton-

nage and will ratoon for many more cuttings. If allowed to fully ripen the yield or sugar will be highly satisfactory. It would not be possible to run a central at a profit if all of its fields were planted to this cane, since all would mature so late as to make too short a grinding season. It is simply folly to cut this cane green and rush it to the mill before it has developed any sugar.

Yellow Caledonia is very resistant to the ordinary forms of root disease and it is a strong ratooner. As it almost never arrows it can be safely carried over as "long crop" or "*caña quedada*", as is so extensively done with it in Hawaii. In some soils in Porto Rico, however, it tends to become hollow and dry if carried over to the second year. It proves, however, to be rather susceptible to the vascular-bundle fungus, fields having been occasionally seen that were seriously injured from this cause. It is very susceptible to mosaic, or at least it is very seriously injured by it when attacked, the growth being immediately dwarfed and the plant often actually dying within a few months. In some instances it seems to contract the disease less readily than some other kinds. Diseased plants are so easily recognized that roguing is made easy. It is probable that more attention has been paid to cleaning up fields of this kind in order to secure a supply of clean seed than with any other variety. It is very resistant indeed if not fully immune, to gum disease, which at the present moment is a matter of great importance.

The following selected analyses will serve to give an idea of what may be expected of this kind under different conditions of ripeness and immaturity. For a fuller discussion of its chemical qualities and analyses from other parts of the Island see Circular 33, by ex-Director E. D. Colón, now general manager of Central Plazuela, who has made a comprehensive study of this variety under Porto Rican conditions:

Kind	Date	Age	Extr.	Brix.	Sucr.	R. S.	Purl.	Fiber
Y. Cal. ....	2-1912	Plant .....		15.2	11.3	2.6	74.3	.....
Y. Cal. ....	12-8-20	Rat. 10 mo....	72.4	13.01	8.60	3.16	66.15	9.93
Cristalina....	12-8-20	Rat. 10 mo....	75.9	16.63	13.41	1.78	85.76	10.80
Y. Cal. ....	1-24-21	Rat. 15 mo....	67.4	16.60	13.37	1.51	80.54	13.44
Cristalina....	1-24-21	Rat. 15 mo....	70.3	17.85	16.14	0.33	90.42	11.26
Y. Cal. ....	2-4-21	Pl. 16 mo. ...	61.5	18.90	17.70	0.69	93.65	13.86
Cristalina ....	2-4-21	Pl. 16 mo....	65.2	18.40	17.27	0.85	93.85	11.83

This last is the only case in our records where Yellow Caledonia has fully equaled Cristalina grown under the same conditions. It was from a dry hill top where the cane was fully mature, but it illustrates the folly of cutting this kinds when it only contains 10 or 12 per cent sucrose.

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## APPENDIX A

### SIMPLE CHARACTERISTICS WHICH CAN BE EMPLOYED FOR DISTINGUISHING BETWEEN CERTAIN PAIRS OF DECIDEDLY SIMILAR VARIETIES

- Ba-6032 & Ba-11569.—In the former the buds exceed the growth ring by  $\frac{1}{3}$ rd of length, while in Ba-11569 they scarcely exceed growth ring.
- BH-10(12) & Ba-6032.—Ba-6032 has a pronounced brownish growth ring not usually encountered in the former.
- BH-10(12) & B-117.—The latter has a long and wide apical tuft on the bud, whereas the apical tuft in BH-10(12) is very scant or wanting.
- D-117 & B-1809.—D-117 has a long and wide ligular process on one side only, whereas in B-1809 the ligular process is wanting or very poorly developed.
- PR-328 & 358.—In the latter the buds exceed the growth ring by  $\frac{1}{3}$  of length, while in PR-328 they barely exceed the growth ring.
- PR-433 & 492.—PR-492 has a well developed, broad and long apical tuft on bud, while in the former the apical tuft is decidedly scanty.
- Yellow Caledonia and D-625.—The latter has a pronounced bright red growth ring, which is much less conspicuous and usually green in Yellow Caledonia.

## APPENDIX B

### GLOSSARY: TERMS USED IN DESCRIBING CANES

- Acuminate:** ending in a long, drawn-out, slender point.  
**Acute:** ending in a sharp point.  
**Apical:** at the apex or point.  
**Arrow:** the flower of the cane, including the panicle and its stalk.  
**Basal placs:** the dense mass of short, appressed, usually crisped hairs found at the base of the buds.  
**Bloom:** a coating of wax on the stalks and leaf sheaths.  
**Ciliate:** fringed with long, waxy hairs.  
**Cm.:** centimeter; one hundredth of a meter ( $2\frac{1}{2}$  cm. = 1 inch).  
**Collar:** the outside angle at the joining of the leaf blade and leaf sheath.  
**Concolorous:** of the same color.  
**Dorsal:** on the back.  
**Fimbriate:** margin uneven, with minute points; fringed.  
**Flush:** the change in color of a green cane to pink, red or purple when exposed to light.  
**Furrow:** a groove in the internode extending up from the bud.  
**Glabrate:** nearly glabrous, almost smooth.  
**Glabrous:** smooth, no coating of any kind.  
**Glaucous:** covered with a thin, waxy coating, bloom, coated with wax.  
**Growth ring:** a narrow circle where the root band of the node joins the internode above. The tissue of this ring remains long in a condition of active growth. If the stalk fall over, the growth of this tissue enables the top to again become erect.  
**Habit:** the general appearance and mode of growth.  
**Internode:** that part of the stalk between the nodes. The word "joint" is sometimes popularly used for the internode, but again it may mean the node.  
**Lanceolate:** long and pointed but broader below, like the head of a lance.  
**Lannate:** woolly, covered with short, more or less felted hairs.  
**Leaf blade:** the free green part of the leaf.  
**Leaf scar:** the base of the leaf sheath which remains on the stalk when the leaf falls.  
**Leaf sheath:** the base of the leaf which encircles the stalk.  
**Ligular process:** protuberance at the top of the leaf sheath at the throat where the leaf blade joins the sheath.  
**Ligule:** a short, horny membrane pressed against the stalk at the throat where the leaf blade joins the sheath.  
**Margin (of bud):** a flat, sterile fold or the outer bud scales. It may be narrow or broad, uniform in width or shouldered.  
**Mm.:** millimeter; one-tenth of a centimeter or the one-thousandth part of a meter.



**Node:** That part of the cane where the bud is situated. It includes the growth ring, the root band, the leaf scar, and the glaucous band.

**Obovate:** egg-shaped; broadest above.

**Obtuse:** blunt; not sharp pointed.

**Orbicular:** nearly circular in outline.

**Oval:** broadest in middle with ends equal and rounded.

**Ovate:** egg-shaped; broader below.

**Peduncle:** the stalk of the arrow; the flower stalk.

**Plicate:** folded like a fan.

**Rachis:** the central axis of the flower panicle; really a prolongation of the peduncle.

**Root band:** that region of the node above the bud where the ends of the rudimentary roots may be seen ready to protrude and grow when the cane is planted.

**Serrate:** with the margin cut into sharp notches like saw teeth.

**Serrulate:** the margin with very small teeth.

**Staggered:** zig-zag; internodes not in straight line.

**Stooling:** the comparative number of stalk in a hill; suckering; tillering.

**Throat:** the inner angle where the leaf blade joins the sheath.

**Triangular-ovate:** the base broad and rounded but the sides straight and ending in a point.

**Tumid:** irregularly swollen or enlarged.

**Undulate:** wavy.

**Vestiture:** a coating of hairs.

## APPENDIX C

### A SELECTED ANNOTATED BIBLIOGRAPHY OF PAPERS DEALING WITH CANE VARIETIES IN PORTO RICO

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**BRANDES, E. W.**

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- (67) Resultados de una Demostración sobre Propagación de Variedades de Caña. P. R. Depto. de Agra. y Trab., Circ. de Fom. 7, pp. 44-6; 1926. Results of a demonstration with PR-417, 440, 460 and D-1135.

DODDS, H. H.

- (68) Cane Varieties Suitable for Natal. Ref. Bk. Sug. Ind. of World, pub. by La. Planter and Sugar Mfr., July, 1926, pp. 31-3. An interesting discussion and diagram of origin and relative resistance of descendants of Kassoer to mosaic disease.

EARLE, F. S.

- (69) The Resistance of Cane Varieties to the Yellow Stripe or Mosaic Disease. Ins. Expt. Sta. of P. R., Bull. 19; 1919.
- (70) Varieties of Sugar Cane in Porto Rico. Jour. Dept. Agr. of P. R., III, 2; Apr., 1919.
- (71) Variedades de Caña. P. R. Ins. Expt. Sta., Circ. 23; Apr., 1920.
- (72) Sugar-Cane Root-Disease Investigations. Jour. Dept. Agr. of P. R., IV, 1; Oct., 1920. Discussion of varietal resistance to root diseases.
- (73) Sugar-Cane Varieties of Porto Rico—III. *Ibid*, V, 3; July, 1921. The splendid work on varieties of which the present paper is a continuation.
- (74) Fertilizers in Porto Rico. Mem. Assn. Sug. Tech. P. R., I, 1, p. 17; June, 1922. Effect of fertilizer ingredients on maturity of cane.
- (75) Sugar-Cane Cultivation. Journ. Dep. Agr. P. R., VIII, 2, pp. 7-13; Apr., 1924. One of the few worth-while papers on this subject, as far as Porto Rico is concerned.
- (76) Cane Varieties Resistant to Salt Lands. *Ibid*, pp. 14-15. Description of a very necessary plan for obtaining information on this all-important point in certain sections.
- (77) Urge la Extinción del Matizado. Rev. de Agra. de P. R., XIII, 4, pp. 249-50. 1924. Some more dotting of i's and crossing of t's in some plain remarks by the man who first called attention to practical mosaic control in Porto Rico.

FAWCETT, G. L.

- (78) Algunas Descripciones de las Variedades de Java y Otras Cañas. Rev. Ind. y Agr. de Tuc., VI, pp. 509-23; May, 1916. Valuable original descriptions, according to Jeswiet system, of P.O.J. 36, 105, 213 & 234.
- (79) Algunas Descripciones Autorizadas de Cañas Originales de Java. *Ibid*, VIII, pp. 195-214; 1918. Detailed botanical descriptions with cuts of P.O.J. 36 and 213, translated into Spanish from the original Dutch of Dr. J. Jeswiet.
- (80) La Obtención de Cañas de Semilla Producida en la Argentina. *Ibid*, X, pp. 31-41; 1919. Mentions the plantation of P.O.J. 36, 213 & 234 made by Rosenfeld in the northern provinces of the Argentine with the object of obtaining flowers—"the first plantation of cane made by the Station outside of the Province of Tucumán."

**GILES, G. M.**

- (81) Some Notes on Tile Drainage on the South Coast of P. R. Jour. Dept. or Agr. of P. R., VIII, 2, pp. 58-60; Apr., 1924. A matter on which we need much more information for our varietal planning in different types of soil.

**GRIVOT GRAND COURT, STAHL, AGUSTÍN, & ACOSTA, JOSÉ JULIÁN.**

- (82) Informe sobre la Enfermedad de la Caña, 1878. (Reprinted by Dr. Stahl in La Enfermedad de la Caña en Puerto Rico, 1880.)

**LÓPEZ DOMÍNGUEZ, FRANCISCO A.**

- (83) The Sugar Yield of the Uba Cane in Porto Rico. Ins. Expt. Sta. of P. R., Bull. 28. A very complete study.
- (84) Fertilizer Experiments on Cane. *Ibid*, Bull. 29. Another of the characteristically complete studies by this writer.
- (85) Depreciation of Cane Caused by Fire and by Delays in Shipping. *Ibid*, Bull. 30; May, 1922. Experiments with depreciation for several varieties. A most useful study.
- (86) Reports of the Ins. Expt. Station of P. R., 1924-25 and 1925-26. Gives summaries of varietal work to date.

**LÓPEZ DOMÍNGUEZ, FRANCISCO A., & FERNÁNDEZ GARCÍA, R.**

- (87) An Interesting Case of Boiler Tube Corrosion. Journ. Dept. Agr. of P. R., VIII, 2, pp. 40-6; Apr., 1924. While not a varietal investigation, this is an interesting phenomenon in the manufacture of P. R. sugar.

**LÓPEZ TUERO, FERNANDO.**

- (88) Caña de Azúcar. San Juan, 1895. A practical treatise on sugar-cane culture in which 22 varieties are touched.

**LUCCA, F.**

- (89) Resultado de un Semillero de Caña. P. R. Depto. de Agra. y Trabajo, Circ. de Fomento No. 7, pp. 33-5; 1926. Discussion of the establishment of seed beds of BH-10 (12) and SC-12/4.

**MATZ, JULIUS.**

- (90) Gumming Disease of Sugar Cane. Jour. Dept. Agr. of P. R., VI, 3, pp. 1-21; July, 1922. A detailed discussion of this disease in Porto Rico and a consideration of varietal susceptibility.
- (91) Dry Top Rot of Sugar Cane. A Vascular Disease. *Ibid*, pp. 28-47. Description of this *Plasmodiophora* disease discovered by Matz and a consideration of varietal susceptibility to same.

**MAY, D. W.**

- (92) Fed. Expt. Station, Mayagüez, P. R., Bull. 9; 1910.



## McCONNIE, R. C.

- (93) Nuevas Variedades de Caña de Azúcar. Rev. de Agra. de P. R., I: 12-17; 1917.
- (94) Cane Cultivation at Fajardo. Mem. Assn. Sug. Technologists of P. R., I, 1, pp. 22-4; June, 1922. Another valuable paper on this subject, of which we have all too few.

## MENÉNDEZ RAMOS, R.

- (95) Annl. Repts. Ins. Expt. Sta. of P. R., 1921-22, 1922-23 and 1923-24. Contain considerable material on varieties.
- (96) Estudios sobre el Mosaico de la Caña. Rev. de Agra. de P. R., XIII, 4 pp. 219-26; Oct., 1924. Observations of this disease in PR-333.
- (97) La Caña de Hawaii 109. *Ibid*, pp. 255-64. Translation of Hawaiian description of this variety.
- (98) Variedades de Caña. *Ibid*, pp. 273-6. Brief observations of varieties made in previous annual report.

## ORTON, W. A.

- (99) The Tropical Plant Research Foundation and its Work for the Sugar Industry. Ref. Bk. of the Sug. Ind. of World, pub. by La. Planter & Sug. Mfr., July, 1926, pp. 45-7. Mentions trip of Porto Rico's Special Cane Technologist to make recommendations for varietal and other cane studies in Peru.

## PAGE, R. L.

- (100) The Future of the Uba Cane in Porto Rico. Mem. Assn. Sug. Tech., I, 1, pp. 25-7. 1922. Thinks that the future of this cane depends largely on the fabrication department.
- (101) Implement Tillage for Irrigation. Journ. Dept. Agr. of P. R., VIII, 2 pp. 16-21; Apr., 1924. Gives some decidedly practical suggestions along this line.

## QUÍÑONES, ANTONIO RUIZ.

- (102) Mem. sobre la Enfermedad de la Caña. Aug., 1877.

## RICHARDSON KUNTZ, P.

- (103) Annl. Repts. of the Agronomist for 1921-22, 1922-23, 1923-24 and 1925-26. In corresponding Annl. Repts. of the Ins. Sta. Gives considerable data on distribution of varieties, but few results of genuine experimental work.
- (104) Estudio Comparativo de las Cañas Kavangire, Zwinga y Cayanna 10. P. R. Ins. Expt. Sta., Circ. 73; Nov., 1923. A not too illuminating explanation of how to distinguish between these almost indistinguishable canes.



## RIVERA, EUGENIO M.

- (105) Informe Preliminar sobre Algunas Variedades de Caña en la Islá de Cuba. Rev. de Agra. de P. R., XIII, 4, pp. 227-36; Oct., 1924. A rather interesting series of observations on development of canes taken from Porto Rico to Cuba.

## ROSENFELD, ARTHUR H.

- (106) Una Enfermedad de las Raíces de la Caña. Rev. Tuc., I, 9, pp. 18-20; Feb., 1911. Records *Marasmius sacchari* on roots of some P.O.J. canes.
- (107) El Trabajo de la Estación. Rev. Tuc., I, 9, pp. 44-7; Feb., 1911. "At the present time the Station is experimenting with 211 varieties of sugar cane from Louisiana, Barbados, Cuba, Porto Rico, Demerara, Java, Spain, Brazil, Argentine and other countries."
- (108) La Propagación de Nuevas Variedades de Caña de Semilla. Rev. Tuc., III, pp. 53-66; Jul., 1912. Critical review of Agee's paper on this subject before La. Sugar Planters' Assn. on 13th April, 1911.
- (109) Diez de las Cañas más Prometedoras que Están Experimentándose en la Estación Experimental. Rev. Tuc., III, pp. 109-33; Ago., 1912. Lecture given before the Sarmiento Society in Tucumán. Ranks P.O.J. 36, 213 & 234 amongst the ten most promising of the 250-odd varieties tried.
- (110) La Caña Java P.O.J. 228 Rev. Tuc., III, pp. 139-42; Sept., 1912. Critical exptl. comparison of P.O.J. 228 with 36, 213 & 234. "P.O.J. 228 was inferior in every way to the other varieties—in chemical analysis as well as in yield of cane."
- (111) The Most Promising Varieties of Cane under Trial at the Tucumán Expt. Station. I. S. J., XVI, pp. 12-23; 1914. Contains in English practically the same subject matter as (109).
- (112) Las Cañas de Java en la Estación Experimental Agrícola. La Gaceta, Tucumán; May, 1914. Comments on breakage of a mill roll said to have been due to high fiber content of P.O.J. 234 being ground at time. "It is positively ridiculous to take the attitude that these high-fiber canes cannot be successfully ground in the modern Tucumán centrals . . . . The high fiber content of some of these canes does not in any sense constitute an obstacle to their employment . . . . In a simple mechanical problem such as this is Tucumán ought to be able to find the same solution which has been encountered by any other sugar country." Gives fiber content of P.O.J. 36, 213 & 234 and shows that many Java mills grind continuously canes with higher fiber content than any of these.

## ROSENFELD, ARTHUR H.—Continued

- (113) Maduración de las Cañas Extranjeras. Rev. Tuc., IV, pp. 527-9; 1914. Analyses made in April, 1914, some two months before initiation of crop (corresponding to October in P. R.), showed good stages of maturity for some of the most promising P.O.J. canes. P.O.J. 234 again demonstrated itself a very early maturer with 86% purity and 14% suc. in juice. P.O.J. 36 showed 80.4% and 13.8%. "The Java 234 & 36 (P.O.J.) seem to possess in high degree the characteristic of early maturity which is so outstanding in our native canes."
- (114) Discurso en Reunión de Plantadores, 14 May, 1914, Rev. Tuc., V, pp. 1-4; Jun., 1914. Calls attention to need of caution and patience in variety expts., as well as to positive danger of jumping at conclusions from a few years' results. "This point should be clearly demonstrated by the fact that, almost without exception, the new varieties of cane which gave us the most promising results the first year of their trial are not today, after four years of careful and accurate investigation from every standpoint, . . . those we can recommend for replacing the native canes."
- (115) Las Cañas de Java y su Contenido de Sacarosa. Rev. Tuc., V, pp. 199-207; Oct., 1914. Various comparative analyses of P.O.J. 36, 213, & 234 with native canes in Tucumán during 1914 crop. P.O.J. 234 appears in one analysis from Expt. Sta. with 20% sucrose in juice and in another from San Pablo with 19½%. "The analyses of the Java canes have turned out relatively as good as those of the canes of the country."
- (116) Ensayos con Abonos durante Cuatro Años. Rev. Tuc., V, 8, pp. 323-61; Jan., 1915. Uniformly negative results from comm. fertilizer applications to Rayada cane indicate that Mosaic Disease has so weakened cane that it does not respond to fertilization.
- (117) Memoria de la Estación Exptl. Correspondiente al Año 1914. Rev. Tuc., V, pp. 415-37; Mar., 1915. Short review of work of Station with varieties, especially the P.O.J. canes, during year.
- (118) Resultados de Cinco Años de Experimentación con Variedades de Caña. Rev. Tuc., VI, 6, pp. 231-78; Nov. 1915. "P.O.J. 36, on account of the characteristics already discussed, appears to be the cane destined to replace the Creole (Rayada) cane in our Province, the P.O.J. 213 & 234 . . . following in the order of their mention."
- (119) Plan del Campo Experimental. Estn. Exptl. Agr. de Tuc., Circ. Especial; 1915-16. Notes on various expts. with P.O.J. canes and diagram of exptl. plats.

## ROSENFELD, ARTHUR H.—Continued

- (120) Maduración de las Cañas Extranjeras. *Rev. Tuc.*, VI, 434–6; Mar., 1916. Analyses of P.O.J. 36, 213 & 234 made latter part of April, 1916. "The analyses . . . show . . . very respectable percentages of sugar in the juices of these varieties which we now know to be of early maturity and enable us to predict for the coming crop at least normal purities."
- (121) Identificación de las Cañas de Java. *Rev. Tuc.*, VI, p. 437; Mar., 1916. Planters who desire to propagate P.O.J. 36, 213 & 234 should be certain that seed they obtain is of these varieties and if in doubt should send specimens to Expt. Sta. for identification.
- (122) La Caña Kavangire. *La Gaceta, Tucumán*; 15 Abril, 1916. Calls attention to confusion amongst certain planters in identification of Kavangire & P.O.J. 234. "The planter who purchases Uba thinking that he is obtaining P.O.J. 234, paying the price demanded for the latter, is losing money."
- (123) La Estación Experimental Agrícola de Tucumán en el Centenario de la Independencia Argentina. *Rev. Tuc.*, VII, pp. 1–82; 1916. "The value of these investigations has been recognized both within and without the country, not the least important of these being those which have enabled the Station to recommend to the planters a series of cane varieties which give far superior results to those commonly employed, as well as the best methods of planting, seed selection, cultivation, etc."
- (124) Some Epoch-Making Experiments in the Argentine: The Java Canes in Tucumán. Sugar, N. Y., Dec., 1917. Discussion of results with Java seedlings in Tucumán and their bearing on the Argentine sugar industry.
- (125) Some Remarks on the Tucumán Sugar Industry. Published by American Commercial Club, Buenos Aires; Dec., 1918. An address before the Comm. Club, covering more or less same ground as (124).
- (126) Estudios Gráficos de las Diversas Variedades de Java en las Colonias de Santa Ana. *Rev. Tuc.*, X, 2, pp. 57–8; 1919. "According to yield and analysis there is little to choose between the 36 and 213, the former probably being preferable only on account of its erect growth, small amount of lodging and easier stripping."
- (127) La Estación Experimental de Tucumán; Retrospecto de sus Trabajos. *Revista Azucarera*, Buenos Aires, XVIII, pp. 305–9; Oct., 1919. "In the present crop 90% of the cane ground in the Province is of the Java varieties."
- (128) What the Tucumán Expt. Station has Done for the Argentine Sugar Industry. *I. S. J.*, XXI, pp. 488–93;

ROSENFELD, ARTHUR H.—Continued

1919. Covers in English largely the same ground as (127).
- (129) Some notes on the Tucumán Sugar Industry. I. S. J., XXI, pp. 606-8; 1919. Brief description of climate and short history of sugar industry in that Province up to the time of the replacement of the commonly grown canes by the P.O.J.
  - (130) Kavangire—Porto Rico's Mosaic-Resisting Cane. I. S. J., XXII, pp. 26-33; 1910. Considers that thinness of Uba and P.O.J. varieties does not constitute an insuperable objection to their adoption. "The thin, rapid-growing, but not at all aesthetically appearing P.O.J. 36 & 213 . . . have been universally adopted in Tucumán, only a few rows of native cane being seen today, carefully guarded and nursed as an invalid might be by the friends of his youth."
  - (131) La Caña Kavangire en Tucumán y Puerto Rico. Rev. Azucarera. Buenos Aires, XVIII, pp. 146-8; May, 1920. Contains in Spanish practically same subject-matter as (130).
  - (132) The Argentine Sugar Industry. I. S. J., XXII, pp. 388-94; July, 1920. Mentions tremendous impulse given Arg. sugar industry by P.O.J. 36 & 213.
  - (133) Power Cultivation of Sugar Cane. I. S. J., XXII, pp. 499-501; Sept. 1920. Tractor cultivation of P.O.J. 36 & 213, with a number of cuts of methods and machinery employed.
  - (134) The Question of the Distance between Cane Rows. I. S. J., XXII, pp. 558-65 & 629-35; Oct. & Nov., 1920. A rather detailed study of results obtained in various parts of the world, including those obtained at the Tucumán Expt. Sta. with native canes and with P.O.J. ones later employed as basis of experimentation.
  - (135) The Java Canes in Tucumán. I. S. J., XXII, pp. 681-3; Dec., 1920. Gives results obtained at Ingenio Santa Ana with P.O.J. 36 & 213 on very large scale, these results covering over a thousand acres.
  - (136) The Question of the Distance Between Cane Rows. I. S. J., XXIV, pp. 72-6; 1922. Bringing (134) up to date.
  - (137) Lo que la Estación Exptl. de Tucumán ha Hecho por la Industria Azucarera. La Hacienda, Buffalo, pp. 291-6; Oct., 1922. History of the work of the Tucumán Station with varieties and calculations of money value of the substitution of the native canes in that Province by the P.O.J. varieties recommended by the Station.
  - (138) La Caña Kavangire. La Hacienda, Buffalo, pp. 131-4 & 169-72; May & Jun., 1923. Stresses point that, just as high fiber content of P.O.J. canes in Tucumán did

## ROSENFELD, ARTHUR H.—Continued

- not prevent their universal adoption there, this factor should not weigh too heavily in the balance against the use of Uba cane in Porto Rico.
- (139) A Beneficial Aspect of the Sugar-Cane Mosaic Disease. *I. S. J.*, XXVI, pp. 191-5; Apr., 1924. "In the heaviest-infected districts along the west and northwest coast (of P. R.) . . . the tolerant P.O.J. 36, 105 and 213 are being employed on a large scale with most promising results."
  - (140) Aspecto Beneficioso del Matizado de la Caña de Azúcar. *La Crónica Comercial y Financiera de Cuba*, I, 5, pp. 7-9; May 1924. Spanish translation by C. A. Figueroa of (139).
  - (141) Annl. Repts. of the Special Technologist for Cane, 1923-24 and 1924-25. In corresponding reports of the Insular Experiment Station of Porto Rico. Brief resúmenes of work under way during the various years.
  - (142) "Luz y Aire" en el Cultivo Moderno de la Caña. *Rev. de Agra. de Puerto Rico*, XIII, 4, pp. 237-48; Oct., 1924. A discussion of wide planting of sugar cane the world over, in which the varietal variation of row distance is also considered.
  - (143) The Java P.O.J. Canes in Tucumán and Porto Rico. *Journ. Dept. Agr. of P. R.* VIII, 3; July, 1924. A complete study of the behavior of these canes in two widely separated and climatically distinct countries.
  - (144) Crítica del Sistema Jeswiet. *Chaparra Agrícola*, I, 9, pp. 34-5; Ene., 1925. A letter to Dr. Eva Mameli de Calvino in regard to the applicability of the Jeswiet system of varietal classification in widely separated parts of the globe.
  - (145) Present-Day Cane Varieties. In Barrett's "Food Plants of Porto Rico", *Ibid.*, IX, 2, pp. 94-8; Apr., 1925. A discussion in brief form of the varieties most popular in Porto Rico at this time.
  - (146) Tucumán & Louisiana—A Parallel. *Ref. Book Sugar Ind. of World*, July, 1925.
  - (147) The BII 10(12) and SC 12/4 Canes. *Ibid.*, IX, 3, pp. 215-247; July, 1925. A discussion of these two most promising canes in all the West Indies.
  - (148) Maximum Conclusions from Minimum Data. *La Planter & Sugar Mfr.*, Nov. 1925.
  - (149) La Estación Experimental Agrícola de la Sociedad Nacional Agraria del Perú. Proyecto Presentado a la Sociedad Nacional Agraria; Lima, 1926. A survey of the sugar and cotton industries of Peru by the Special Cane Technologist of the Porto Rican Insular Experiment Station, with recommendations for the establishment of



## ROSENFELD, ARTHUR H.—Continued

an agricultural experiment station in Peru, with especial stress being laid on the importance of immediate varietal investigations in a country where practically only one variety is cultivated and that one—Otaheite—one of the most susceptible to disease in others countries.

- (150) Report of the Division of Agronomy. Annl. Rept. Ins. Expt. Sta. of P. R., 1924-25. (Published Sept., 1926).
- (151) El Gusano Chupador de la Caña de Azúcar. Rev. Ind. y Agr. de Tucumán, IV, pp. 229-366; 1913-1914. Calls attention to reduced borer infestation in the thinner, more fibrous canes of the P.O.J. type.

## ROSENFELD, ARTHUR H., &amp; BARBER, T. C.

- (152) Trabajos de las Sub-Estaciones 1912-13. *Revista Industrial y Agrícola de Tucumán* (Argentina), IV, pp. 495-514; 1914. Give some of the first substation results with the P.O.J. canes, which experiments finally made possible the rapid change-over to these varieties a few years later.

## SÁNCHEZ, JULIO.

- (152) Informe del Agrónomo Regional. Msto. Nacl. de Agricultura de la Rep. Argentina, 1917. Rept. on visits to two sugar centrals in the northern Province of Jujuy, where he reports favorably on plantings of P.O.J. canes.

## STAHL, AGUSTÍN.

- (154) Estudios Prácticos sobre la Enfermedad de la Caña. *La Prensa*, 5th April & 2nd May, 1878. (Reprinted in *La Enfermedad de la Caña*, 1880, below).
- (155) La Enfermedad de la Caña de Azúcar en Puerto Rico. San Juan, 1880. In this most important paper Dr. Stahl brings together all the various reports that had been published regarding the cane epidemic of 1872. He gives 23 kinds of cane known to occur in Porto Rico, with notes on their disease resistance.

## TAGGART, W. G.

- (156) P.O.J. 234, Windrowed and Cut. Sug. Bull. of the American Sugar Cane League, IV, 13, pp. 1-3; 1st April, 1926. Finds surprisingly little inversion in cut and windrowed cane of this variety, which is quite at variance with the results of all other investigators.

## VEYE, RAFAEL A.

- (157) Our Experience with Cane Varieties. Memoirs of the Assn. of Sugar Technologists of Porto Rico, I, 1, pp. 28-31; June, 1922. A most interesting review of varietal work at Central Fajardo by one who has done splendid work there.

## VEVE, RAFAEL A.—Continued

- (158) Influence of Lime on Cane Cultivation. Ref. Book of the Sugar Ind. of the World, published by the La. Planter and Sugar Mfr., July, 1925, pp. 36-7. A short presentation of the important physical and chemical effects of liming on sugar-cane soils in a section where D-433 has long been the predominant variety.

## WOLCOTT, G. N.

- (159) The Influence of the Variety of Sugar-Cane on its Infestation by *Diatraea saccharalis* and the Other Factors Affecting the Abundance of the Moth Borer. Jour. of the P. R. Dept. of Agr. & Labor, VI, 1, pp. 21-31; Jan., 1922. One of the few papers extant on the relation of variety to borer infestation.

## YODER, P. A.

- (160) Rare Cases of Mosaic Disease in Highly Resistant Varieties of Sugar Cane. U. S. Dept. Agr., Circ. 392; July, 1926. The paper which destroyed the theory of immunity in the Chinese group of canes, practically all of which Yoder has found with slight mosaic infections.

## ZERBAN, F.

- (161) Advertencia Respecto a la Importación de Nuevas Variedades de Caña. Rev. Ind. y Agr. de Tucumán (Argta.), I, 1, pp. 16-7; June, 1910. Mentions early introduction of P.O.J. canes and calls attention to danger of introducing pests and diseases if importations are not properly inspected by competent authorities.

## ZERBAN, F., &amp; ROSENFELD, ARTHUR H.

- (162) ¿Cómo Puede Mejorarse la Producción y Calidad de la Caña? *Ibid.*, I, 3 & 4, pp. 1-16; Ago. & Sept., 1910. Discuss early production of seedling canes in Barbados and Java.



# INDEX TO SUGAR-CANE VARIETIES

	Page
Badilla (New Guinea 15) .....	84
Bambú Blanca .....	85
Bambú Rayada .....	86
Bambú Rosada .....	86
Bambú Rosada de Rayas Moradas .....	87
The Barbados Seedlings .....	87
B-39 .....	87
B-67 .....	88
B-88 .....	89
B-109 .....	90
B-114 .....	91
B-117 .....	91
B-119 .....	92
B-147 .....	93
B-154 .....	94
B-156 .....	94
B-208 .....	94
B-268 .....	96
B-306 .....	97
B-347 .....	97
B-376 .....	99
B-381 .....	100
B-417 .....	100
B-425 .....	101
B-1030 .....	102
B-1355 .....	104
B-1356 .....	105
B-1376 .....	105
B-1529 .....	105
B-1566 .....	105
B-1753 .....	106
B-1809 .....	107
B-3289 .....	109
B-3390 .....	109
B-3405 .....	110
B-3412 .....	111
B-3578 .....	113
B-3675 .....	113
B-3696 .....	113
B-3696, Striped .....	115
B-3708 .....	115
B-3747 .....	116
B-3750 .....	116
B-3819 .....	116
B-3859 .....	116
B-3922 .....	118

	Page
B-4028 .....	119
B-4507 .....	119
B-4578 .....	119
B-4596 .....	120
B-4934 .....	121
B-6032 .....	122
B-6048 .....	122
B-6292 .....	122
B-6308 .....	124
B-6341 .....	124
B-6346 .....	124
B-6388 .....	124
B-6436 .....	124
B-6460 .....	124
B-6536 .....	126
B-6835 .....	127
B-7169 .....	127
B-7245 .....	127
B-8660 .....	128
Ba-6032 .....	128
Ba-7924 .....	130
Ba-8069 .....	131
Ba-8409 .....	132
Ba-11403 .....	132
Ba-11569 .....	133
Ba-12079 .....	135
BH-10(12) .....	136
BSF-12(34) .....	141
BSF-12(45) .....	141
BSF-12(48) .....	141
BSF-12(50) .....	142
BSF-13(8) .....	143
BSF-13(14) .....	143
Bengala .....	143
Bois Rouge .....	143
Bois Rouge Blandée .....	143
Borbon .....	144
Calancana .....	144
Cavengerie .....	145
Cavengerie Negra .....	147
Cavengerie Rayada .....	147
Cavengerie Roja .....	147
Cayana .....	149
Japanese .....	151
Japanese Fodder .....	151
'Java Unknown' .....	151
Kavangire .....	154
Khera .....	156
Merthi .....	157
Oshima .....	159
SPI-33243 .....	160



# INDEX

331

	Page
Tekcha .....	160
Uba .....	161
Yon-Tan-San (Yontanzan) .....	162
Zwinga .....	163
Co-210 .....	165
Co-213 .....	166
Co-214 .....	167
Co-281 .....	168
Crema .....	168
Creole (Criolla) .....	169
Cristalina .....	169
C-35 (Super-Cristalina) .....	171
C-46 .....	172
C-768 .....	173
CH-64(21) ("Super-Uba") .....	173
D-74 .....	175
D-95 .....	177
D-108 .....	178
D-109 .....	178
D-116 .....	180
D-117 .....	182
D-147 .....	184
D-216 .....	184
D-247 .....	185
D-355 .....	185
D-357 .....	185
D-419 .....	186
D-433 .....	187
D-436 .....	190
D-448 .....	190
D-504 .....	192
D-625 .....	193
A' Non-Flowering Strain of D-625 .....	195
D-689 .....	196
D-695 .....	196
D-848 .....	197
D-1111 .....	197
D-1135 .....	197
D-1170 .....	200
D-4395 .....	200
Diamond-185 .....	200
Diard .....	201
Egyptian .....	201
Elephant .....	201
Guingham .....	202
Hawaii-109 .....	202
Jamaica-72 .....	204
E.K.-28 .....	205
Kassoer .....	206
P.O.J.-36(M) .....	209
P.O.J.-100 .....	210

	Page
Java 105-P.O.J.	210
Java 213-P.O.J.	213
P.O.J.-213, Striped	213
Java 228-P.O.J.	214
Java 234-P.O.J.	214
P.O.J.-826	215
P.O.J.-979	216
P.O.J.-1228	217
P.O.J.-1499	217
P.O.J.-2221	218
P.O.J.-2379	219
P.O.J.-2714	220
P.O.J.-2725	220
Tjep-24	222
Kakoe	223
Lahaina	223
Lahaina Striped	223
Light Stripe	223
Louisiana Purple	223
L-511	223
Lousier	225
Malabarde	226
Morada	226
Otaheite	226
Palo Rojo	229
Palo Rojo Claro	229
Penang	229
Pesante	230
F.C.-140	232
F.C.-214	233
F.C.-306, Striped	234
G.C.-493	235
G.C.-701	236
G.C.-1480	237
G.C.-1486	237
M.P.R.-50	237
P.R.-202	238
P.R.-207	239
P.R.-208	241
P.R.-209	242
P.R.-210	243
P.R.-219	244
P.R.-230	245
P.R.-260	247
P.R.-270	248
P.R.-271	249
P.R.-272	250
P.R.-292	251
P.R.-308	253
P.R.-309	254
P.R.-317	255

# INDEX

333

	Page
P.R.-318	256
P.R.-328	257
P.R.-329	258
Striped Sports of PR-329	259
P.R.-358	260
P.R.-383	261
P.R.-417	261
P.R.-422	263
P.R.-430	264
P.R.-431	265
P.R.-433	266
P.R.-440	267
P.R.-460	268
P.R.-472	269
P.R.-487	270
P.R.-491	271
P.R.-492	272
PR-492 Red	274
P.R.-502	274
P.R.-503	275
P.R.-507	276
P.R.-543	277
P.R.-545	278
P.R.-561	279
P.R.-579	280
P.R.-649	281
P.R.-662	281
P.R.-676	282
Rayada	283
Rayada Mexicana	284
Reina Caledonia	284
Rosa Morada	285
Rosa Rayada	286
Saconi	286
Sta. Cruz-12(4)	286
St. Croix-12(11)	291
SC-22(21)	291
St. Kitts Seedling	292
Salangor	293
Salangor Rayada	294
Salangor Rojo	294
Sarangola	294
Seeley Seedling	294
Tamarin	296
Tanna	297
Toledo	297
T-77	298
Tuc-439	299
Tuc-444	300
Tuc-454	300
Tuc-472	301



# 334 THE JOURNAL OF THE DEPARTMENT OF AGRICULTURE

Tuc-491	Page
Tuc-507	301
Tuc-510	302
Tuc-511	303
Tuc-531	303
Tuc-544	304
Verde Zic-Zac	304
White Transparent	305
Yellow Caledonia	305

